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PAVING SEWERAGE

MUNICIPAL ENGINEERING

WATERWORKS PARKS

A MONTHLY MAGAZINE.

DEVOTED TO THE IMPROVEMENT OF CITIES.

GOOD ROADS, STREET CONSTRUCTION,
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SANITATION,
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Municipal Engineering

VOLUME XVIII. MARCH, NINETEEN HUNDRED. NUMBER 3.

MUNICIPAL OWNERSHIP OF COMBINED WATER-WORKS AND ELECTRIC-LIGHT PLANTS.*

By Louis E. Fischer, City Engr. and Supt. Electric-Light and Water-Works, Paris, Ill.

The magnitude of a water-works system, and the great responsibility that rests upon the operators of this institution, in the larger cities, is such that the idea of private ownership is not extensively entertained. In fact, of the thirty or more cities of the United States, having a population greater than 80,000, only four are under private control, namely: Indianapolis, Omaha, New Orleans and Louisville. Of these thirty or more cities, New Orleans has the highest water rate in all things; Omaha, very near the maximum, and Indianapolis and Louisville approximately average rates. If a comparison of water rates could be considered a criterion of the cost to the tax-payers, we might find in this argument for municipal ownership; however, this is not necessary, as with the development of sound public policy in these cities, and the tendency toward civil service reform, the municipal water-works has a clear field.

Among smaller cities, there remain many that are supplied by private corporations, and as a matter of fact, many of the voters of these cities adhere to these corporations, not because they are informed on the comparative costs as to tax-payers, or that they realize the injustice of a governing body of any city to grant any person or persons the privilege of using the thoroughfares for a business so general in extent as water systems, but from a lack of confidence in public officials. This lack of confidence is not surprising, for legislatures have not yet enacted laws requiring municipal accounting that will show the construction and operating expenses of public institutions; nor have civil service laws extended to these small municipalities, both of which are essential to the successful operation of any institution.

Public lighting, however, is in a different stage of development. Of these thirty larger cities first referred to, we find but a very few with a municipal light plant, Detroit and Chicago being the only ones known to the writer. Unfortunately the results obtained in these two cities do not encourage other cities in the operation of similar institutions.

*Read before Illinois Society of Civil Engineers and Surveyors at Moline meeting

A year or so ago, the matter of renewing the contract of the city of Boston with the Boston Electric Light Company was under discussion. The mayor of Boston, Mr. Josiah Quincy, caused a report on the comparative cost of public lighting in Boston and certain other cities to be made by ex-Mayor Matthews. Mr. Matthews personally visited the cities of Chicago, St. Louis, Cincinnati, Baltimore, Philadelphia and New York, and apparently made a very intelligent and unbiased investigation of the costs of electric arc lighting in these cities. The results of this investigation are particularly interesting from the fact that he put all costs on a basis with Boston. He reported the following:

City.	Maintenance cost per lamp per year.	Taxes, fire ins., liability ins., depreciation and interest per lamp.	Arc cost per lamp to city.	Arc cost per lamp to city on comparative basis of Boston.
Boston	.....	.....	.....	127 25
Detroit (Mun.)	58.09	49.30	102.36	134.57
Chicago (Mun.)	89.00	64.03	153.03	154.80
Chicago (Contract.)	.....	.....	137.50	129.20
St. Louis	.....	.....	74.95	99.67
Cincinnati	.....	.....	84.90	110.89
Baltimore	.....	.....	127 75	154.08
Philadelphia	.....	.....	121.54	148.33
New York	.....	.....	.....	139.90

Here the cost per arc of the Chicago municipal plant is the highest, while the majority of prices are below the frequently quoted Detroit cost. From this, we must either conclude that these municipal plants are extravagantly or uneconomically managed, which no doubt is the case in Chicago, or else these private plants are operated at a loss, which is a generally conceded fact in the case of St. Louis, while that city was lighted.

So far as is known, the system of accounting in Detroit is good, and there seems to have been a tendency towards economical management, from the fact that the late chairman of the lighting commission failed to have his renomination by the mayor confirmed by the council, owing to the labor influence brought to bear on that body. However, if the price of labor in the Detroit plant is higher than in private plants, or is consistent with the average price of labor, even though there be no reduction in the cost to the city, we have excellent argument for municipal ownership, for there is a marked tendency on the part of private lighting corporations to increase net earnings at the expense of the comfort of their workmen.

Looking further into the Detroit case, we find that the cost per arc, as given by the city, is about $85; as given by Mr. Matthews, $102.36; as given by Mr. Samuel Insull, approximately $140. The contract price offered at the time of the installation of this municipal plant was $102.20. Taking Mr. Matthews' figures as being most nearly correct, being an unbiased investigator, we find the cost of lighting to the city approximately the same as offered by contract. However, the offered contract price of $102.20 was consequent to the agitation of municipal ownership, the old price having been $133.80, $31.44 higher than the present cost to the city. This demonstrates the advantages that a private corporation will take of a municipality. Most contracts for both light and water are let for a period of years. At the expiration of these periods, there is usually a war between several corporations, or between the corporation and the municipality, which is not quieted until sufficient money has been expended to hush the voices of the officials in charge. The

COMMONWEALTH AVE. AT WASHINGTON ST., BOSTON, WHILE UNDER CONSTRUCTION.

city of St. Louis is at present engaging in such a war.

Of the 230 or more cities and villages in Illinois having a light plant, approximately thirty-five have municipal plants. Most of these municipal plants only operate arc lights, as the cities and villages incorporated under the general act are not enabled to do commercial lighting, due to the non-existence of specific legislation to that effect. There is a little data to be obtained regarding the cost of lighting per arc lamp in these public stations, but it is safe to say that most of them are operated with questionable economy. The cost of contract lighting varies over the state from $30 per 2,000-candle power arc moonlight schedule, at Danville, to $100 and more in a number of other cities. These figures are the extremes. It is beyond a question that no municipal plant is furnishing light at as low a cost as $30, but that price at Danville is consequent to the agitation of municipal ownership. The average contract price of 2,000-candle power arc light over the state is $75. It is questionable whether a smaller city, operating probably seventy-five or a hundred lamps, can furnish the same at materially less cost, from the fact that the necessary number of employes and the cost of intelligent management form too large a portion of the cost of maintenance. If these cities could operate commercial lighting systems and power circuits in connection with the arc systems, it would change the conditions materially. As a whole it appears:

1. That municipal water-works are practically general in larger cities, and although not so in smaller cities at the present time, they will continue to grow in favor with the development of municipal accounting, which will demonstrate more clearly the financial advantages of such institutions.

2. That the few municipal public lighting plants in larger cities thus far show no reduction in the cost of lighting to the city, and in the smaller cities the short working hours and small output prevent the accomplishment of the most economical results.

The leading aim in the strife for the municipal ownership of public service institutions is the giving of the best service at the lowest cost to their users, and the lowest municipal taxation. Experience thus far shows, that with an untaxed investment, and an exclusive and perpetual franchise, that private corporations in most cases are ready to perform public service at the same price it is costing the community where it is rendered by municipal institutions. The reasons for this are obvious to everyone acquainted with municipal government. But in order to make the popular cry for municipal ownership tenable in more than its effect on the development of an ideal government, the first requisite is to reduce the cost of service to a minimum and below the cost paid to private corporations. The foundation for the accomplishment of this result lies in the making of an intelligent design and installation of an industrial plant, and the inaugurating of a thorough system of operation, which important duty falls to the lot of the engineer.

STONY BROOK, AT BOYLSTON AVE., BOSTON, SHOWING BRIDGE CARRIED AWAY BY FLOOD.

THE MARKET SIDE OF THE PAVING BRICK INDUSTRY.*

By F. B. Stevens.

In this progressive age there are books and papers written upon all subjects. The studious individual can with equal facility acquire a theoretical knowledge of "how to swim" or of "how to get rich." Either theory when put into actual practice, whether in a sea of turbulent waters or in the maelstrom o business competition, will become of little value; still, it may not be out of the range of possibilities to believe that in the near future some enthusiastic individual will fee called upon to write a book upon "The Market Side of the Paving Brick Industry."

It is not from the basis of a manufacturer that I am to consider this subject, but from a little experience as a seller of paving brick—the product of others.

The position of the middle-man —appropriately named—is often most undesirable. In case of a difference of opinion, or of contention, concerning quality or conditions, say between a corporation to whom he sells material and the manufacturer from whom he furnishes his supply, his position, if justly filled, becomes that of adjudicator of differences, a righteous judge between opposing forces; if just, he is impartial; if impartial, he sees the faults of both. It will not be disputed that it is more difficult to harmonize many minds than it is to influence one. To sell to a corporation, to complete the detail of such sale with perfect satisfaction, is a task, compared to which the ordinary transactions of commercial life between two individuals sink into insignificance.

If it be on the one hand the board of public works, following the advice or suggestion of the city engineer, who recommends the material, which action is approved or rejected by the council, or whether it be, as in some interior cities, the entire council votes for the recommendation of the street committee, it is quite often the case that such favorable action is not unanimous and the minority is left to criticise. Woe betide the luckless seller of paving brick who incurs the enmity of one of the "many men of many minds" who make up the municipal intellect. The municipal mind is acting "to the last hour of act" even where the individual mind under like conditions would be reasonable, yielding and considerate.

I have seen paving brick "inspected" and thrown out by "inspectors" who could scarcely distinguish brick from mud ; who had been appointed about election time as a reward for their well-doing in other lines, and therefore, must necessarily show a pile of chips. They showed it. Good brick were thrown out, poor ones put in the pavement; nevertheless the pile of culls showed they had been "on the job," and, of course, their report was final. I have seen paving brick on account of their color, or lack of it, thrown out, when uniformity of size, close compact fracture, freedom from laminations, and other indications which

*Read at the annual convention of the National Brick Manufacturers' Association in Detroit, Feb. 5-10, 1900.

FURNACE ROOM OF COMBUSTIBLE WASTE PLANT IN BOSTON.

we are wont to consider evidence of good material, were disregarded because of a slight change in complexion. These are only a few of the ills to which the business of selling paving brick is subjected; there are others.

The rattler test, for instance, under existing conditions, is most uncertain. Long bricks, short bricks, fat bricks, lean ones, are dumped promiscuously into an iron cylinder, together with cubes of iron or irregular castings, as the case may be; one brick, longer than some of the fat ones, is perhaps carried part way around with the cylinder until it reaches the top, then down it goes with a thud and off is knocked a corner. This loss, when the brick is taken out and weighed, is called abrasion loss. Of course this is not fair unless each particular brick is subjected to the same conditions. Under existing methods this is not possible.

I saw, some time ago, a blue print of a cylinder constructed for the purpose of testing brick, to the inside of which the brick were firmly clamped, and the street surface of the brick is subjected to the wear of the loose material in the center of the cylinder. This, doubtless, is the nearest approach to uniformity in the present method of a rattler test. It is, therefore, something of a guide, but it should not be final, and no doubt it is quite often that good brick are excluded on account of a lack of careful and uniform test methods. The brick that receives all justice in a rattler test is like the immortal Joey Bagstock—"He's tough, ma'am, tough and devilish sly."

There is, of course, to this subject—the selling of brick to corporations—like that of all others, another side. I believe there are two distinct or individual departments to any well-conducted manufacturing business—a manufacturing department and a selling department. Perhaps I should say that these departments should be distinct and individual in their management. The management of one should not include the management of the other. In short, the business of both departments should not be outlined, arranged and controlled by the same man or men. If the selling department of a paving brick industry finds difficulties to contend with such as I mention, if brick are not carefully selected for shipment, if culls are allowed to go out as they are sometimes, in too large a proportion, often in the very first shipment on a new contract, the selling end should hold the manufacturing end responsible, and correct the error before it is too late in the one case and prevent it in others. One man can not give good service and cover too much detail. It is only by concentration of purpose that the result desired is effected. If a lot of green hands are hired in summer to load brick when the superintendent can not be omnipresent and the manager is away attending brick lettings or at the office arranging the commercial details of business, if economy is too much sought for in the manufacturing end, such economy will eventually swell the expense, or the "cull" account, and the selling end will suffer, no matter how profuse the eloquence or explanations of the representative at the selling end may be, whether he be a middle-man or an employe.

There are other improvements that it may not be out of place to suggest, but which, perhaps, are not so easy to accomplish. The lack of uniformity of size now existing in the products of one kiln, on account of the uneven heat in that

SURFACE DRAIN AND MAIN SEWER, BOSTON.

kiln, leaves the opportunity open for any contractor to introduce a claim for damages, though it may be proved groundless. This lack of conformity of size to sample, while "not so deep as a well, nor so wide as a church door; yet 'tis enough, 'twill serve" that he may declare it necessitates the increased use of tar or cement filler, increased labor in selecting or guaging brick to keep straight the lines of the pavement, or make a dozen other claims to delay or prevent settlement.

It has been suggested by some city authorities, that if the manufacturers would adopt a uniform size, so that a street laid ten years ago with a brick now out of the market might be easily repaired with another brick, the size being the same, the new patch would "tooth in" with the old pavement. Whether this plan would be of any advantage to the manufacturers is a question.

It is said that every man thinks his business bristles with the greatest thorns. Socrates thought that if all our misfortunes were laid in one common heap, whence every man must take an equal portion, most persons would be content to take their own and depart. However, to smooth all the rough places, to correct all the errors, would indeed require the sum of human wisdom.

I fear the increased demand for paving brick may change the maxim of the manufacturers to quantity instead of quality in production. It is now, therefore, an opportune time for each manufacturer to economize with expense, to equip with necessary facilities, to provide sufficient working force to cover all the details so long overlooked, in short, to aim his arrow at the star, even though, perchance, it hits the cat on the fence.

With more care, and more pains at the factory, and consequently better results, the city authorities, I trust, will soon recognize the better standard, will become less rigid, less suspicious, and less exacting. Then the cares of the paving brick manufacturer will become an unknown quantity and he may once more enjoy the refreshing sleep of his youth.

When such a possibility becomes a fact, the seller, the middle-man, who has borne "the whips and scorns of time," should not be without his reward; he also may hope to win "golden opinions from all sorts of people."

CENTRAL STATION HEATING IN CONNECTION WITH ELECTRIC-LIGHTING PLANTS.*

By W. H. Schott.

In every manufacturing plant the shrewd manager is always trying to find some way of utilizing everything in the form of a by-product that he may happen to have in his particular line, and the up-to-date electric-light manager should be on the same plane.

A few years ago investors believed that all that was necessary to draw large dividends was to purchase a certain kind of apparatus, put in almost any kind of a steam plant, and they would have a complete station, and as soon as the light was turned on the dividends

*Condensed from a paper read before the Northwestern Electrical Association.

VIEW OF A BROKEN-DOWN SEWER IN HALLECK STREET, BOSTON.

would begin to roll in. But, later on, some of these same investors found that instead of having a gold mine they were loaded with an elephant. They had been led to believe that they could put in any particular system, employ any novice to run same, and it was all right; but they found that the expense kept constantly increasing; why, they did not know. First one stockholder would try his hand at running it, and then another, and finally they would employ an expert to operate for them. This has been the experience of a number of plants throughout the country. Investors now know that in order to make an electric-light plant pay it is necessary to construct it on the very best lines, and then operate it accordingly. The average plant uses simple non-condensing engines, and, as a matter of course, has a large number of heat units constantly going to waste. These heat units should be utilized, and in most cases can be utilized if the proper apparatus is installed. What to install is an engineering problem that should be passed upon by some one competent to judge.

Within the last few years a few plants throughout the country have installed exhaust steam systems for heating, trying to secure a new earning power after having utilized the steam for the purpose of driving their electric load. After my own investigation of both the exhaust and hot water systems I was convinced that for certain cases the exhaust steam, either using back pressure on the engines or a vacuum pump as the case might be, would be all right for certain cases, but where it required an extensive system to cover scattered areas it was impractical on account of the heavy investment required. But with the hot water system in towns where the business is located within two miles of the power station, it could be taken care of from one power house at a minimum cost compared with a steam plant. The hot water system can be installed more cheaply than the exhaust steam. As smaller pipes may be used to do the same amount of work, they require less expensive insulation, on account of lower temperatures, the expansion is not so great, consequently fewer expansion joints are required, and with the hot water system heat can be stored up during such times as a surplus of steam exists and utilized when the amount of steam going to waste would be insufficient to do the required work.

To the consumer, in addition to offering a uniform heat, you can offer hot water for bath and laundry purposes, which will secure at least 30 per cent. of the business.

The average electric-light plant in our smaller cities has had, as a basis of starting, a city contract. In this day and age we have to realize that we must put our plants where we are independent of a city contract, so that, in case it is lost, our business has not been destroyed and investment gone. I do not know of a better way to do this than to put in a heating plant to utilize the exhaust steam, which is our by-product, and by the proper disposal will increase our earning power and secure our investment; at the same time in so doing you are establishing something which every city is bound to have, namely, a central heating station.

CANAL STREET RELIEF SEWER, CROSSING UNDER PROPOSED SUBWAY IN HANOVER STREET, BOSTON.

AN EFFICIENT SYSTEM OF GARBAGE COLLECTION FOR A SMALL CITY. *

By Col. Edward Kittilsen.

The scientific men of this country have given great thought to all kinds of improvements in manufacturing and science, but have not given enough thought to the garbage question.

I have been requested to give my views on the collection of garbage. First, the housekeeper is responsible for the care and collection of garbage, and as garbage originates in every household, the housekeeper and servants should be properly taught how to care for and dispose of same.

The garbage or kitchen refuse should be placed in galvanized iron receptacles, each holding not less than three gallons, nor more than ten gallons, with a tight cover. Garbage should be kept separate and never mixed with ashes, rubbish, tin cans, broken glass, crockery, rags, etc.

Ashes should be placed in galvanized iron receptacles, holding about thirty-two gallons, not using a wooden barrel or box, as there is danger of fire from hot ashes. Rubbish and other refuse matter should be placed in boxes, baskets, or any receptacle not too large for one man to handle, and should be placed in a convenient place on the property line, so as to be ready for the scavenger at the time collections are to be made. It should be unlawful to cast or throw any filth, garbage or refuse matter of any kind into any street, court, lane, alley, market-place, wharf, dock or sewer inlet.

No person should be allowed to collect or remove kitchen garbage and offal from any dwelling, hotel, restaurant, or other building, or convey the same through any of the streets, lanes, or alleys of the built-up portions of the city, except it be collected and removed in water-tight steel or iron-bodied carts, wagons or other vehicles, and securely covered, so that none of the contents shall fall, leak or spill therefrom, or be exposed to public view.

For many years in the early history of the city of Moline up to 1882, all garbage and refuse matter was taken to the river front at the most convenient point, or taken to the outskirts of the city and dumped on any vacant ground, the people getting rid of the kitchen refuse the best way they could. In 1883 signs were put up preventing dumping along the river front, and regular dumping places were established by the city authorities.

Under the board of health, in 1882, the sanitary work in reference to the care and disposal of garbage was started. It was ordered that kitchen garbage be deposited in tight receptacles with a cover, and the property-holders directed to remove the same at their own expense. This order was never complied with.

In 1883, the mayor ordered the city marshal to have the garbage and filth removed from the alleys, at the expense of the city, which was done in the following manner: Water-tight boxes, or tanks, with tight covers, were made and placed on common farm wagons. In this manner the garbage was gathered

*Condensed from a paper read before the Illinois Society of Engineers and Surveyors.

and hauled three miles into the country and buried. This system was carried on for several years. Garbage collected in districts not having any sewer contained from one-half to two-thirds water. This was expensive to bury, especially in soil that is composed of yellow clay.

In 1894, for the purpose of getting rid of the water, I tried an experiment which proved to be a success. I constructed a tank similar to a mortar-bed used by masons to slack lime in, only on a larger scale. In one end of this tank I placed two sets of one-half inch screens, so as to allow nothing but water to escape. This was then connected with the sewer, and water connections made with the city fire hydrant and a 2½-inch hose, with a 1½-inch nozzle. The wagons were backed up to this tank, the garbage dumped into it and a stream of water turned into the garbage and it was thoroughly washed. It takes ten or fifteen minutes to wash each load by this process. The putrid matter is dissolved, and the garbage becomes almost odorless. The water passing from the tank through the screens into the sewer reduces the bulk and weight of the garbage. The garbage is then sprinkled with lime or other disinfectant. After the garbage has gone through this process, the weight is reduced, as well as the quantity, so that from eight to fifteen loads dumped into the tank have been loaded on one wagon and taken into the country by one team of horses, thereby being a saving in which two teams could do the work that formerly took five, and having no water to bury also made a greater saving.

In the spring of 1895 the old garbage-boxes were worn out, and it was impossible to keep them odorless by scrubbing with disinfectants after each load. They were a nuisance upon the streets and were abandoned. They have been replaced by four odorless, steel-bodied, sanitary dump-carts. This is the most perfect vehicle designed for gathering and transporting offensive material in a healthful manner through city streets. They can be kept clean and odorless at very small expense. The carts hold fifty-four to sixty-four cubic feet each.

Dry refuse, ashes and rubbish are gathered in common dump-carts and removed to the city dump, which is covered daily with earth.

Garbage is only taken from private families by the city. All business houses, hotels and restaurants take care of and remove their own garbage.

The city contracted for and had two crematories built—one for the cremation of garbage and one for the cremation of night soil; but did not accept them on account of their not being able to fulfill the contract.

Destroying garbage by cremation in any furnace that has yet been constructed is not an economical plan, for the expense of operating them is too great for any small city, or even large cities. There is a fortune to be made by the person who invents a furnace which can burn garbage at a small expense, so as to be within the reach of all cities. It is a fact that it is one of the most sanitary ways to dispose of garbage.

Burying garbage is the cheapest as well as the sanitary way to dispose of it, if the cities have the ground for the purpose. The cheapest method known to dispose of garbage and night soil is by dumping it into our river, but it is a barbarous way, as it pollutes the water

for the cities situated further down who depend on river water for drinking purposes, and there should be legislation against this practice. I might say right here that the city of Moline does not allow anything to be dumped into the river.

It has cost $6,012.97 to collect the garbage, consisting of kitchen refuse and all rubbish and waste material, from the residence portion of the city, being an area of 2,180 acres, with a population of 21,000. In doing this work we have used four sanitary dump-carts for removing dry rubbish, street sweepings, with nine horses and twelve to fourteen men. The above cost includes the cost of covering the city dumps with earth, also sweepings of two and one-half miles of brick pavement.

We have collected the garbage over the entire city twice or three times a week during the summer months, and once or twice during the winter months. We can remove garbage at less expense in the winter than in summer. In the winter garbage can be deposited in boxes or old sugar barrels, as it will freeze, and when the receptacle is full, it is thrown upon the cart and the box or barrel, with contents, taken away, the property-holders placing another receptacle in its place.

It is folly for the city to clean up in the summer, and let a winter's accumulation remain until the frost is out of the ground, and the ground saturated with filth and foul matter which will breed disease during the hot summer months.

The city of Moline owns the horses, carts, vehicles and tools which are used in the health department for cleaning the city. I believe Moline is the only city in Illinois that owns a complete equipment for cleaning the city.

It is my opinion that with the use of the sanitary garbage carts, and with the galvanized iron receptacles for depositing garbage by the householder, and with the necessary dump carts to handle dry rubbish, the garbage being taken by the sanitary carts to the tanks, or tank, located at some convenient place, there washing the garbage thoroughly, allowing the fluid to run into the sewer, the residue or solid matter to be hauled out of the city and buried, is the cheapest and most sanitary manner of collecting and disposing of garbage.

What is the best way to collect and dispose of garbage, rubbish, filth, offal, etc.—at the expense of the city, or to compel the property-holder or tenants to do it at their own personal expense? From my experience I will answer *by the city*, as viewed from a sanitary point. "Why?" Because just as soon as the people are obliged to remove it at their expense, they will not remove any if they can help it. They hide it, dump it into vaults, throw it into sheds, under buildings, or anywhere out of sight. I do not say that all do this, but some do. If the city does the work, the people will bring all filth or rubbish to light and clean up their property and keep it in a sanitary condition.

CONSTRUCTION OF KEWANEE SEWERAGE SYSTEM.*

By J. C. Quade, City Engineer of Kewanee.

The general conditions for a sewerage system in Kewanee are very favorable, the city being situated on a divide and its drainage being to the southwest, southeast and northeast, towards the Illinois river, and to the northwest to Rock river. The elevation above sea level is approximately 850 feet, Kewanee being the highest point between Chicago and Burlington. The maximum fall from the center of the city to the east city limits, about one mile, is 65 feet.

The system is the separate system of sewers, and was designed for nearly the entire south part of the city, or nearly all of the city lying south of the C., B. & Q. R. R., the present population of that part of the city being about 5,000. In designing the outlet sewer lying outside of the city limits and extending nearly one mile east of the city, provision was made for 15,000 inhabitants. The outlet sewer is 18 inches in diameter and is laid on a .2 per cent. gradient. This sewer will carry 3,000,000 gallons per day with a 2.6 per cent. velocity, and this will make the maximum flow at any time as computed for 15,000 population, 1,800,000 gallons, or a little more than one-half full.

The maximum gradient that could be obtained on the outlet, was only .2 per cent. and in order to make provision for future filtration beds, it was necessary to keep the outlet at the disposal grounds as high as possible. Nine acres of land were purchased by the city for future use, and this is located about one mile east of the city limits.

The disposal tanks are nearly a duplicate of the one at Champaign, Ill., with a few minor changes. For the latter plans, and also consultation on this work, I am indebted to Prof. A. N. Talbot.

In computing the main sewers, 120 gallons per capita was used, and on lateral sewers 100 gallons per capita. All cellar drainage is taken care of wherever no other provision has been made, and in the business portion of the city roof water is allowed to run into the sewer, which is taken into consideration in computing the sizes of sewers in that portion of the city, using one-fourth the total area as the amount of roof surface to be taken care of.

The maximum and minimum gradients as used in the sewer construction is given below, as follows:

Pipe.	Max., per cent.	Min., per cent.
18-inch	0.2	0.2
15-inch	0.94	0.6
12-inch	2.26	0 6
10 inch	3.30	0.46
8 inch	5	0.52
6-inch house connections		1.5 to 2.0

The minimum gradients given above show what has been used on parts of one and possibly on parts of several lines, and there are but very few of these used. The lowest allowable gradients used on fully 90 per cent. of the work (and most of these are above this minimum) is as follows:

Sewer.	Per cent.
8-inch	1.0
10-inch	0 80
12-inch	0.60
15-inch	0.5

*Condensed from a paper read before the annual meeting of the Illinois Society of Engineers and Surveyors.

Nothing less than 8-inch pipe is used on lateral sewers, and these were kept from 2½ to 3 feet below the cellar floors in nearly all cases.

The house connections are all 6 inches in diameter, and were run from the lateral sewer to each property line within the lateral sewer district. This will avoid the continual tearing up of streets, and will be no hindrance to paving work in case any street is to be paved. The minimum grades used on house connections in most cases exceeded 1½ to 2 per cent., but in a few cases it was as low as 1 per cent.

The design of man-holes, flush tanks, lamp holes, double flush tanks and combined man-holes and flush tanks can not be shown here. In straight lines running through man-holes, the latter was constructed of an elliptical shape, 3 x 4 feet in size, with channel pipe; junction man-holes were circular and 3½ feet in diameter.

In the design and construction of flush tanks the Miller siphon is used. The sewers were run in alleys as much as possible wherever this could be done.

One man-hole was placed, on an average, each 374 feet of main and lateral sewers; the total number of lamp holes constructed were 16 permanent and 6 temporary; the total number of flush tanks constructed, 17.

Permanent lamp holes were placed on the very short lines, having over 1½ to 2 per cent. gradients. Flush tanks were placed at the head of all long lines, at the school-houses and all lines in the business district.

The cost of the main sewers was $11,567, or 36 per cent. of the total cost, and was assessed upon all the property to be benefited by them; that is, over the entire main sewer district, and the balance of the cost assessed upon the property within the lateral sewer district; that is, upon all property benefited by the lateral sewers and where the house connections were run to the property line.

In making the assessments, the entire property within these districts was divided into four classes —business property, semi-business, residence, and outlying property, the assessments being graded at the dividing lines. The average 64-ft. lot in the residence district was assessed, on an average, about $29.50 for lateral and main sewers, including house connections to the property line.

Bids for the construction of the sewer system were opened in July, 1898. Eagan & Munn, of Nebraska City, Neb., were the lowest bidders and were awarded the contract at the prices named in their bid, as follows:

	B.	
Pipe Sewers—		
18 in. pipe sewer laid	32c. per ft.	
15 in. " " "	23c. "	
12 in. " " "	18c. "	
10 in. " " "	14c. "	
8 in. " " "	10c. "	
6 in. house connections laid	9c. per ft.	
6 in. drain tile laid	4c. per ft.	
Trenching and Backfilling—		
Under 6 feet deep	10½c. per ft.	
6 ft. deep and under 8 ft.	14c. per ft.	
8 ft. " " 10 ft.	20c. "	
10 ft. " " 12 ft.	27c. "	
12 ft. " " 14 ft.	36c. "	
14 ft. " " 16 ft.	44c. "	
16 ft. " " 19 ft.	50c. "	
18 ft. " " 20 ft.	55c. "	
20 ft. " " 22 ft.	62c. "	
Man-holes 10 feet deep, complete, each		$28 00
To be added or deducted for each additional foot, plus or minus		2 50
Lampholes 10 feet deep, complete		5 00
To be added or deducted for each additional foot, plus or minus		15
Temporary lampholes per foot		25
Flush tanks @		45 00
Double flush tanks @		100 00
Combined man-hole and flush tank @		70 00
Brick masonry, per cubic yard		7 50
Embankment, per cubic yard		25
Cast-iron pipe laid, per ton		27 50

The total amount of the original contract price was $24,895, not including the disposal tanks and siphons for the flush tanks. The engineer's total estimate was $31,418. The contract prices of Eagan & Munn were too low, because of the ground-water encountered in the work, and their contract price should have been increased from 15 to 20 per cent., in order to make a reasonable profit on the work. To all appearances, the contractors did not make any money on this work, and probably lost all of their own time.

The work was started early in August, 1898, and owing to the fact that the city contemplated the paving of Tremont street, and that an ordinance had been passed by the council for this work, the construction on the sewers was started on that street, on a short line, about 450 feet in length, in a 12 by 14-foot cut.

The difficulties encountered in the soil here, owing to the large amount of water in the ground and the nature of the soil itself, which was of clay, mingled with a fine quicksand, caused a great deal of trouble to the contractors. The clay was very plastic and soft, and in some cases would work up from under the sheeting. There being no outlet for the ground-water, the same had to be pumped by hand out of the ditch. When the line was about half completed, the laborers went on a strike for about a week, and at the end of this time the trench was in a miserable condition.

By the time the line was completed the contractors had lost about $400. This discouraged them very much, which handicapped them for the remainder of the work, at least for the balance of the season in 1898. Not much difficulty was experienced, however, in the construction of the outlet sewer. A good deal of water was encountered on the 15-inch sewer line, but most of this work was under 6 feet. All of the 15-inch sewer was laid near a natural water-course, the line running from 10 to 100 feet from the same. For the purpose of keeping the bottom dry, a 6-inch drain tile was laid, 1 foot below and 1 foot off center of the 15-inch pipe. This work was kept about 100 feet ahead of the pipe laying, which insured quite a dry bottom for all of this work. Especially was this of value on account of the large amount of ground water and seepage from the creek.

The original time allowed for the completion of the work was four months, which would require an average daily amount of work of approximately 550 lineal feet of pipe laid, including manholes, flush tanks, etc. Only about one-half of the work, however, was completed in 1898, and the time was extended until August, 1899. The work was not completed, however, until October 15, 1899, owing to the nature of the soil and the ground water encountered. All the work had to be done in small gangs, and one inspector was required for each gang; consequently the cost of inspection was considerable, and more than the average cost for such work.

The disposal tanks are located in the southwest corner of the disposal grounds. The principal difference in the design and construction of the tanks, from those at Champaign, is that the outer walls of the tanks proper were made 18 inches at the bottom and 12 inches at the top, the walls were constructed of concrete, made of Vulcanite Portland cement, in the proportion of one, two and four, the walls being plastered on the

inside with a ¾-inch finishing material.

Owing to the fact that the foundation for the walls was quite soft in places, oak piles 4 x 4 inches x 5 feet in length were driven, three in a row and spaced every 2 feet. The mud was taken out for a depth of 12 inches below the top of the piles, and 6 inches of this space was filled in with cinders, properly tamped, and then the concrete put on top of this. The bottom of the tank was also of concrete, 6 inches in thickness and laid upon a 6-inch cinder base.

A building was placed over the tanks, 8 feet in height, to the eaves, with a double pitched roof covering the same.

The disposal grounds are partly an old artificial lake bed, made fifteen or twenty years ago by the C., B. & Q. railroad to supply their engines with water.

For the purpose of constructing future filtration beds the city of Kewanee purchased nine acres of very desirable land, at a total cost of $1,500, which was paid for out of its general fund.

A large open ditch 3,000 feet in length was constructed through this artificial lake bed, the same being 5 feet in width at the bottom, with a 1½ to 1 slope on the sides, on a gradient of .12 per cent. The same will carry the storm-water coming through this run, and also in dry seasons draw the water from the swampy soil. The elevation of the bottom of the ditch at the upper end is about on a level with the bottom of the tanks, and there is a sufficient fall at any time for the proper construction of filtration beds.

The run through which this ditch was constructed was a very soft, black soil, and the contract price for this work was 22 cents per cubic yard, or barely sufficient to pay expenses, with only a small margin of profit.

The total amount of main and lateral sewers constructed is	8.05 miles
The total amount of house connections	2.35 miles
Making total amount of sewers	10.4 miles
The total cost as per the final estimate, not including the disposal tanks, siphons and inspection, etc., is	$25,135.71
Total cost of siphons	333.20
Total cost of disposal tanks proper	1,349.11
One Webster's 6½ H.-P. gasoline engine	768.29
Building over tanks	418.95
Total cost	$28,005 26
Inspection about 8 per cent	2,280.00
Total	$30,285.26
Total cost, including damages to private property, etc	$32,800.00

From the summary of the final estimate, we find that the average cost per mile for main sewers, lateral and house connections, not including the tanks, engineering and inspection, is $2,417.

The average cost per mile, including engineering, inspection, contingencies, court costs, damages, etc., including tanks, is $3,152 per mile.

In the construction of the sewers, one inspector was put on each pipe-laying gang, and it was his duty to keep a record of all of the gas in water-mains, sewer-pipes, drains, etc., crossed on either the mains or laterals, or on the house connections, their size, depth and description; also to plumb up from all the Ys or Ts left on the side which the same was laid and to drive a stake on the top of the bank, taking his pluses to the same.

These measurements were checked by the assistant engineer in charge of the sewer work and compared

with those of the inspector. The engineer covered the work several times a day, or as often as was necessary.

As no records of this sort had been kept on any of the work previously constructed, these notes are very valuable in locating the various pipes in the ground. The notes for house connections were kept very complete, giving all the details, etc., a form of which is given below:

LINE—LAT. C–8.

Sta. of Main Line.	Junctions. Direction.	Property.	Dist. from Sewer to End of H. C.	Depth at End.	REMARKS.
5 × 02.8....	Y-west.	John Zong..	14.8	9.9	End 17 2 s. of s. e. cor. Zong's brick building, marked (H) in cement walk.
5 × 42.8....	Y-east..	Quinn Block.	35.2	9.4	End opp. c. north window, marked (H) in brick wall.

A similar form was used for recording pipes, etc., crossed.

All changes in direction in the house connections were made with curves, or Ys and curves, no Ts being used at all.

The original estimate of quantities included house connections run to the property line. Owing to the change of four long lines, the actual amount of house connections put in was several thousand feet less than the estimated amount.

THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

HOW STREET INTERSECTIONS SHOULD BE PLANNED.

Cherry street falls 2.12 feet per hundred to the east from 11th to 12th and 1.49 from 12th to 13th. Twelfth street falls 2.83 feet per hundred to the north from Chestnut to Cherry and 3.02 from Cherry to Cedar. The streets are each 66 feet wide and the pavements between curbs 36 feet. How should the intersection of Cherry and 12th streets be laid out? Is there any work on this subject? *F. L. Hancock, C. E., Quincy, Ill.*

The ideal method, so far as appearance, ease of construction and facility for self-cleaning are concerned, is to make the four curb corners of the same elevation, just as though the streets were both level. If the curbs of each street can be kept on parallel lines in the block each way from the intersection this will aid. Evidently this will throw all the fall into the length of the block proper, making the rate of fall in Cherry street from the east property line of 11th to the west property line of 12th about 2.43 feet per 100, instead of 2.12 feet, and increasing the gradients in the other blocks in a similar manner. The slopes on all the streets will thus be broken up at each street intersection by level bits the width of the intersecting streets. Water will flow away from the curb corners at least in one direction except at the southwest corner, where a catch-basin or culvert across one street, or both, will be necessary to

remove the water coming down both streets.

In some cases it is not possible to keep the curb lines on opposite sides of the street at equal elevations on account of existing structures, difficulties in grading lawns or walks, or otherwise. In such cases the crown of the street should be thrown toward the higher side of the street, to keep the slope of cross section of the street within the prescribed form. The crown may even be thrown next the curb, thus making a gutter for water to drain off only on the lower side of the street. At the intersection of two such streets, as in the question stated, the adjustment of the slopes and the lines of the crowns is a nice problem, which is usually solved most satisfactorily on the ground by the eye, guided by stakes set to grade at the most important points. If there are no catch-basins, the drainage being over the surface, the problem is most easily solved if the crowns are located at the higher curb lines, for then the highest point in the intersection (the southwest corner in the question) is not in a gutter, the water flows round the adjacent corners (the southeast and northwest) and crosses the streets to the gutters on the opposite sides, and the waters divide and flow down the streets from the lowest corner. If, as is most frequently the case, the water should be removed from the streets at the intersection, it can be induced to enter the catch-basins more readily if the crowns are far enough from the curb lines to give a little depression at the three higher corners, reducing the velocity of the water in the gutters and giving it a direction toward the inlets. This is most thoroughly done when the intersection is level, but can be done more or less satisfactorily with the crowns in almost any position.

In all but a few very exceptional cases it is possible to make some reduction in the fall in the distance across the intersection. In case the crown is located at the higher curb line the cross section should approximate the form adopted for half the width of a level street 72 feet wide. The cross sections of 12th on the curb lines of Cherry street (for example) would then be of this form from curb line to curb line and the regular gradient of the street might be resumed at the curb lines. In practice the eye will ease off the sudden changes in gradient on the center lines, and the surfaces near the curbs will be modified by the necessities of the method of drainage. This can probably be done in the case under consideration if it is impossible to put in the level cross section. Sometimes the level cross section can be used on one street and not on the other. Sometimes still greater fall is necessary than is contemplated in any of the above. All these variations make it impossible to make definite rules to be applied in all cases. The rules stated above are those probably of most general application. There is little upon the subject in the text-books. A discussion of extreme cases will be found in a report upon a street system for Duluth, Minn., made some years ago.

HOW TO CONSTRUCT A MACADAM ROAD FOR HEAVY TRAFFIC.

In your next issue will you kindly give a general description of a first class macadam street or road for heavy traffic, *i. e.* (*a*), giving foundation and treatment, (*b*) foundation and top dressing, and (*c*) the thickness of the latter before sprinkling and rolling. (*d*) What is considered sufficient rolling?

S. Cameron Corson,
Borough Engineer, Norristown, Pa.

(*a*) After excavation to subgrade, the surface should be thor-

oughly rolled with a 10-ton roller. Any soft spots appearing before or during the rolling should be excavated as deeply as necessary to secure a good foundation and refilled with good, clean, dry material. Broken stone is best, but good earth or sand is satisfactory under most conditions. Great care must be taken with the drainage of the road. If surface ditches are not sufficient to keep the sub-soil dry, drains should be laid to discharge outside the limits of the road surface at convenient points.

(*b*) For poor soil and low country subject to excess of ground water in wet seasons, a Telford foundation should be placed on this sub-grade. This is made up of stones of size to be placed by hand and driven to place by hammer. The layer may be from 6 to 10 inches thick, according to character of stone available, ease of preparation and condition of soil. All interstices in this layer should be filled with fine broken stone or gravel to form a smooth layer.

This layer may be replaced by coarse broken stone of the same thickness, thoroughly rolled with the above roller as laid, using fine broken stone or clean gravel to fill all interstices and as much water to flood it into place as is desirable. Some sub-grades will not permit the use of large quantities of water. Size of stone is determined by local conditions, such as character of stone used, its behavior under the roller, cost of stone and of preparing it. A maximum size is, say, what will pass through a 4-inch screen and be refused by a 2½-inch screen.

(*c*) Upon this foundation layer should be put a layer of broken stone from 4 to 10 inches thick, according to character of foundation, amount of traffic, probability of frequent repair, etc. If more than four inches thick, it will be found desirable to put on in layers of 3 or 4 inches, for convenience in rolling and thoroughness in filling, with clean screenings, or gravel. The stone in this layer may be from 1¼ to 3 inches, not so large as the latter if a thin wearing surface is to be used. Water may be used on this layer as on the foundation layer. The rolling may well be a continuous operation, care being taken that all portions of the layer are so thoroughly rolled that there will be no tendency to creep ahead of the roller when the layer is finally completed.

(*d*) This is the test of sufficiency of rolling, where enough filling and water are used to make it possible to compact the layer of broken stone.

A thin layer of an inch, more or less, of fine broken stone and screenings or gravel with a little clay, when the stone screenings are not of quality to cement the layer, can be used to advantage as a top dressing. On fine roads with much travel this layer may be of good uncrystallized granite or trap rock.

The methods of laying described should be followed carefully. The amounts of material to be used depend so much upon the kind of material, the character of sub-grade, and especially the care which the road will have after completion that the judgment of an engineer with much experience in laying, and especially in keeping roads in repair, should be secured, giving him an opportunity to study the local materials and conditions. The best construction for a locality is not necessarily that meeting the requirements of the worst conditions. True economy is the watchword of the good engineer.

THE BEST METHOD OF POSTING STREET SIGNS AND NUMBERS.

(1) Can you give me any information in reference to the best method of placing the names of the streets at intersections so that the names may be most convenient to any one desiring to know the name of streets?

(2) Please give names of firms who supply metal or other street names and numbers. *David Y. Johnson, Mayor,*
Bedford, Ind.

The simplest method, where houses are near enough the street corners, is to have the street names on strips about 3 to 4 inches wide and long enough for the name, and to attach these strips to the houses below the second-story windows and at the corner nearest the street corner. If a large porch projects out still nearer the street corner, the signs can be put just under the eaves of the porch. Few property-owners will object to a neat sign. The signs can be procured in metal, aluminum, iron, zinc or tin, painted or enameled, or in wood. The cheapest sign, and at the same time a durable one, is usually one of good, clear, fine-grained, well-seasoned wood, thoroughly painted. A black background, perhaps sanded, to prevent reflection of light, with the street name in gilt letters, is easily seen under all circumstances but lack of light, and is as durable as any but the finest stamped or cast metal signs. On corners where houses are not available, and the small boy is not troublesome, a substantial fence can be used. Both these being lacking, a good post, about 8 feet high and well set, can be used. Unless set well in the ground, posts are soon thrown out of plumb by frost or collisions of wagons, etc. If set on the property line, the latter trouble is obviated. Metal posts, aluminum signs, illuminated signs, are offered by various manufacturers of novelties. The wooden signs can be made by local painters.

COMPARATIVE MERITS OF SEPARATE AND COMBINED SYSTEMS OF SEWERAGE.

I would be pleased to have your opinion on a question which is before the city council of Belleville, Ill. The local conditions are as follows: A creek runs through the center of the city limits, which has been used to carry off the sewage, and for want of sufficient flow of running water has created a nuisance in the summer. We also have a sewer on Illinois street of 36 inches, a sewer on Race street of 24 inches, a sewer on West Main street of 42 inches, a sewer on West B street of 24 inches, discharging into the creek. The sewers named and other factory water of two breweries and one distillery, are the causes of making a first-class nuisance out of the creek mentioned. The sewers mentioned, as you will see by their dimensions, are storm-water and sewage sewers. The city engineer proposes to abate the nuisance by constructing a sewer by following the creek as near as possible, starting with a four-foot sewer and terminating with an 18-inch sewer, the sewer to be built so as to cross and recross the creek below its bed and to answer for the purpose of accommodating all future sewers to be constructed as laterals, and utilizing the sewers mentioned as laterals. In addition, the contemplated sewer has a length of 2¼ miles through private property, with a fall of six feet for its entire length. A St. Louis engineer has prepared plans for a sanitary sewer system provided with several main sewers from 3-foot to 12-inch and 8-inch laterals, and the head of every lateral a flush tank, and following the streets. The plea of the opposition to adopting this plan is that sanitary sewers have proved failures where adopted by cities, naming Memphis, Tenn., and Litchfield, Ills., as instances. Please inform me, as one of your subscribers, which of the two plans would be most suitable for local conditions named, bearing in mind that some day the sewage will have to be taken care of at the outlet of the sewer. By so doing you help to solve a knotty question.
Fred. Daab, Belleville, Ill.

The exact system to be adopted for a given city can best be determined by a competent engineer after full examination and study of the local conditions. No one else can offer more than general suggestions, which are practically valueless when details are wanted. If the descriptions of plans are correct, neither plan is a strict application of the separate system, but both admit more or less of the

storm water falling within the city limits. Generally speaking, the separate system is but for small cities, where it is easy to get rid of storm water over the surface, and the combined system is best for large cities and others where the storm water must be carried away in underground conduits. If the sewage must be treated, this plan may be modified by putting the storm water in an independent system, or by putting in an intercepting sewer to collect the ordinary flow of sewage, and storm water overplus to discharge the excess of rains into the outlet stream directly. It is doubtless true that the St. Louis engineer, who is a man of education and experience, has proposed a plan adequate for the purpose, and it is probable that he has made a good approximation to the most economical plan, all things considered. His judgment concerning the modifications of the separate or sanitary system needed to suit the local conditions is safer than that of any one who has not studied the matter as thoroughly and carefully as he, and far better than that of one who does not have personal knowledge of the conditions, or of one who is not well versed in the principles and practice of the solution of such problems. It is a serious error to set aside such plans unless apparently better conclusions are reached by other *equally competent* authority after *equally extended study*.

MELTING LEAD OUT OF JOINTS OF WATER MAINS.

Can you give me the address of the manufacturers of a successful device for the melting out of lead joints of a 20 inch water main? *Bellaire Water-Works,*
By W. J. Kirkpatrick, Sec'y.

D. W. French's lead joint remover cuts the lead out of joints up to 16-inch pipe. Possibly it can be modified for a 20-inch main. B. C. Smith, 275 Pearl St., New York City, sells it. The usual way is to build a wood, coal or coke fire around the joint. A gasoline flame with blow-pipe can be used. The larger it is the better, so long as it can be handled.

DEVICE FOR CUTTING ROOTS OUT OF SEWERS.

In answering, in the February issue of MUNICIPAL ENGINEERING, my letter inquiring about the best way to get rid of tree roots in sewers, you speak of the use of a special tool to get them out. I write to trouble you to let me know if you refer to any tool which is devised for the purpose, and which can be procured, or were you simply speaking generally, advising that a suitable tool be devised and made for the purpose? *E. H. Bouton,*
V.-P. and G. M. R. P. Co.

A scraper was in mind similar to one used for water pipe in St. John, N. B., and described in MUNICIPAL ENGINEERING for June, 1899, by William Murdock. It is also described and picture shown in Folwell's new book on "Water-Supply Engineering." For roots in sewers the shape of knives would probably be modified somewhat, and it would be necessary to drag them back and forth, with the exercise of considerable force, at least the first time the roots are taken out. The piston heads used by Mr. Murdock are to make the water force the machine through the pipe. They would be in the way for cutting roots. It would probably be necessary to drag the machine up stream the first time through. Mr. Folwell's book at $4, can be purchased at this office.

EXPERIMENTS IN OILING ROADS.

Have you tried oiling roads in your section? If so, with what results?
G. W. Stevens, Claremont, N. H.

A short section in Iowa was treated, with favorable results. The most satisfactory roads of this sort

are near Santa Barbara, Cal., where there is plenty of oil or maltha near at hand.

WHERE GARBAGE IS TREATED FOR BY-PRODUCTS.

Can you give names of cities where garbage, instead of being incinerated, is treated for its by products (fertilizers, etc.), and names of firms installing plants of this kind? *D. M. C., Pittsburg, Pa.*

Buffalo uses the Merz system, Philadelphia the Arnold, Bridgeport, Conn., the Holthaus, and Detroit also disposes of its garbage by a reduction process.

(By J. W. Howard, B. L. C. E., for MUNICIPAL ENGINEERING.)

QUANTITY OF ASPHALT AND BRICK PAVEMENTS IN THE UNITED STATES.

How many square yards of sheet asphalt pavement, like Trinidad, has been laid in the United States in the past, and during 1897, 1898 and 1899? Also, how many square yards of brick and Sicilian rock?

F. C. Bushnell,
221 Water street, New Haven, Conn.

The total amount of sheet asphalt pavements of which Trinidad asphalt is the cementing material (the mixture being, asphaltic cement, about 15 per cent.; powdered limestone or powdered silica, about 5 per cent.; sharp sand, about 80 per cent.) in the United States and Canada, on December 31, 1899, was about 27,800,000 square yards, or 1,800 miles, laid by about thirty-six or more paving companies and contractors; one of the companies is a very large one and laid almost one-half of the above.

The total amount of sheet asphalt pavements, including Trinidad, Alcatraz, Bermudez, and pavements laid upon the same general specifications, including the small amount of rock asphalt and some experimental pavements, in the United States and Canada, on December 31, 1899, was about 31,170,000 square yards, or about 1,950 miles.

The amount of bituminous limestone pavements, of which Sicilian asphalt pavements is one, on December 31, was about 900,000 square yards. Other bituminous limestone pavements besides Sicilian, included in preceding, are Seyssel rock and Mons rock, from France.

During 1897, 1898 and 1899, the total amount of Trinidad asphalt pavements laid in the United States and Canada by all companies was about 6,000,000 square yards, and of Sicilian and other limestone asphalt pavements, in the three years, was about 260,000. As to brick, of all kinds, it is not possible to give exact figures. The total amount of brick pavements laid in the United States and Canada, including that which has disappeared and been replaced, up to the end of 1899, may be regarded as about 12,000,000 square yards, or 800 miles. The net amount of brick pavements in use, without regard to condition, on December 31, 1899, was about 5,355,000 square yards, or 357 miles.

The quantity of brick pavements, of all kinds, and upon various foundations, laid in the United States, during 1897, 1898 and 1899, was about 255,000 square yards, or about 170 miles, especially in many cities of the middle west, near the deposits of clay and shale.

[By A. D. Thompson, C. E., for MUNICIPAL ENGINEERING.]

BRICK PAVEMENTS ON COUNTRY ROADS.

Kindly inform me if you know of any instance where brick paving has been used for country roads; if so, the width of the pavement, kind of curbing used and the material used outside of the curbing for holding the same in place. I would like details of all dimensions, cost, location of the road, the length of time they have been opened to traffic, etc.

X. Y. Z., Parkersburg, W. Va.

The advisability of paving a narrow strip of road in the country districts with brick has received a large amount of attention by road-builders and the office of road inquiry during the past few years. A few roads of this character have been constructed, the most noticeable of which is one near Monmouth, Ill., for which J. Ed. Miller, of that city, was engineer. This road was constructed in 1897 and has given excellent satisfaction up to the present time. The pavement is seven feet in width, located in the center of the road, leaving room on each side thereof for a dirt roadway during good weather. After the ground had been properly prepared by grading, it was allowed to stand for two months with an occasional scraping, so it would pack evenly. It was then shaped to the form of the proposed pavement and a foundation of sand five inches in thickness was placed thereon. Upon this sand was placed a single course of the best quality of Galesburg paving brick on edge and the interstices filled with sand. The pavement was held in position by a line of plank curbing on each side thereof, constructed of 2 by 6 oak plank, held by oak stakes 18 inches long, placed at intervals of 4 feet. The top of the plank curbing was located about 2 inches below the top of the bricks. Back of this curbing a shoulder or strip of broken stone was placed, each 2 feet wide and extending to the depth of the sand foundation.

About 3,000 feet of such roadway was completed in 1896 at a cost of between 90 cents and $1.00 per running foot. Drainage was provided for when necessary by a line of five-inch drain tile, laid at a depth of three feet on each side. A full description of this road with detailed items of cost is given in the twelfth annual report of the Illinois Society of Engineers and Surveyors, and also in circular No. 25 of the office of Road Inquiry, Department of Agriculture.

There was also constructed in Cuyahoga county, Ohio, a brick pavement along a country road known as the Wooster pike. This pavement was constructed on the side of the traveled roadway, which roadway was 32 feet wide and was drained by a six-inch drain tile on each side thereof. The road is eight feet in width, and instead of curbing being used on the side to hold the pavement in position, the same end was accomplished by placing along each edge three courses of brick on end, the first course being flush with the top of the pavement, the second course breaking joints and two inches lower, the third course two inches below the second course. A complete description of this brick roadway is contained in bulletin No 17, office of Road Inquiry, Department of Agriculture.

HYDRAULIC DIAGRAMS.

We take pleasure in inserting the following from one of the authors of the book of "Hydraulic Formulæ," reviewed in the February number. It calls attention to the fact that the diagrams given can be used for other cases by some slight computations, and gives the authors' reasons for the size of diagram used. As stated in the review, there is little in common with Coffin's book, the two together covering about all the field of water carriage in pipes and conduits.

To the Editor of Municipal Engineering:

SIR—In the last issue of your magazine I notice a review of "Hydraulic Diagrams," by Charles H. Swan and myself, and hope you will pardon the liberty I take in calling your attention to one or two statements which rather misrepresent the value and usefulness of our book.

In the third paragraph of the review it is stated that "no diagrams for the flow running full are given for any of the eight types of sections but the first." This is, of course, not the case, for the three discharge and one friction diagram refer to all of these types by means of the equation on each ratio diagram, stating "Vert. D = (——) × Diam. -○- circle," which is clearly stated in the text as referring to -○- circle of equal carrying capacity. Thus having the diameter of a circular conduit for any given discharge, we have immediately, by these equations, the diameter of each of the remaining seven types for the same discharge. This is very simple, and does not require separate discharge diagrams for each type of section (which would require $7 \times 4 = 28$ additional diagrams). The size of the diagrams was carefully considered, and according to "least squares" should be read to within a fraction of one per cent. Admitting this, and the fact that we can not measure water within one or two per cent. by the best means available (*i. e.* a weir), and much less predict within a greater percentage the discharging capacity of a conduit, you will readily appreciate why we consider the size of these diagrams sufficiently large. The broken scale on these diagrams, which is original with us, was to admit of greater range of data without sacrificing accuracy in reading (these different scales being carefully calculated to give practically the same percentage of error over the whole diagram).

In the light of these comments, it is evident that Coffin's book, which I consider admirable for water supply work, could contain but little that is treated in ours—his discharge data referring to *circular channels only*, flowing *only full*, does not consider *variation in internal friction*, and does not touch upon the subject of canals. Needless to say, of course, that his book contains much that is not treated under our subject.

My predecessor, the late Charles H. Swan, was, as you may know, in charge of the special hydraulic calculations and design for this commission since its beginning, and our set of diagrams is the outcome of long study and experience on work of the magnitude of ours. In fact, I know of practically no problem in the uniform flow of water in conduits that can not be fully worked out for all the types of sections given, and, considering the variety in the types, approximately worked out for any section. Of course, for rectangular and trapezoidal canals, the whole field is covered within our limitations as to slope and size.

Yours truly,
Theodore Horton, Asst. Engineer.
Boston, Feb. 15., 1900.

COMMENT ON CURRENT TOPICS.

Some Difficulties in Sewage Disposal.

The City of Madison, Wis., is having much trouble over the construction and operation of its new disposal works, largely on account of the involved nature of its contract with the construction company and the division of responsibility arising therefrom. Such troubles arise frequently in private contracts, where the owner attempts to make modifications to reduce cost without full understanding of their effect upon the conditions of the contract.

The consequences of such action are still more disastrous in public contracts on account of the composite nature of the party of the first part and the irresponsibility of the individuals making up that party, the members of the common council.

The contractors in this case offered to put in a plant for chemical precipitation and filtration, and their plan was accepted with certain modifications and omissions of buildings to reduce the cost, and the assumption of the furnishing of machinery by the city. According to the original plan it was proposed to use ferozone as the precipitant in the sedimentation tanks and polarite in the filter, but the city was not required to continue the use of either in the completed and accepted plant. Under the contract the company is to run the plant three months, and the city to run it nine months with results satisfactory to the city before the works are accepted. The company has run the works for more than six months, the decision by the city at the end of three months under the contract being that the efficiency of the plant was not satisfactory. The controversy arising has developed the objectionable features in the original contract and may throw the matter into the courts, or into arbitration, to determine the rights of the two parties.

There is a controversy upon the question of responsibility for lack of a house over tanks and filters, the city claiming that it was not provided for in the original plans, while the contractor claims it was omitted by the city for economy in first cost. The decision on this question will settle the responsibility for any lack of efficiency in the winter season.

The contractor of course disclaims responsibility for the machinery, but it was designed for use with one precipitant and a different one is used, so that there is a material increase in cost of handling on this account.

The use of lime largely increases the amount of sludge, which exceeds the capacity of the sludge press, and necessitates running the sludge on the marsh in which the works are located.

The committee appointed by the city reports that the works are too small for the duty required of them. The contractor claims this is due to the large amount of ground water entering the sewers. At least one filter is supposed to be at rest at all times, but all are in use all the time and are sometimes forced. The purification is therefore not complete. Whether it fulfills the contract can not be determined exactly, since the requirement of the contract is that the effluent shall be as pure as the waters of the lake into which it is discharged were in 1888, as shown by a certain analysis, indefinite because which one of four is not designated. Exact coincidence in chemical composition being impossible, the degree of compliance with the requirement is a matter of judgment. Another requirement in this line is that

there shall be no increase in the amount of growth of vegetation in the lake and river on account of organic matter in the effluent. This also is not a matter of exact measurement.

The differences in claims as to amount of sewage treated should be removed by founding facilities for exact measurement.

On the part of the company it is probable that the objectionable features of the contract were permitted from the desire to install the first plant of the kind in this country, with the hope that it would lead to further contracts. Possibly the company had too much faith in its process. For some reason it seems to have abandoned a prominent part of it—the use of ferozone. On the part of the city the desire seems to have been to save first cost, no matter at what expense to the efficiency of the plant, looking to the company to insure this, but leaving loopholes enough to allow the company to return this responsibility in part upon the city where that part seems to belong. The lesson seems to be the old one which most city officials seem to be unable to learn—that tinkering with technical legal and engineering features of contracts by any but experts leads to difficulty and increased expense.

Niagara River Discharge. At a recent meeting of the Western Society of Engineers, the methods of determining the discharge of the Niagara river, by measurements taken in 1897–8, were fully described by Clinton B. Stewart. The variations in discharge on account of fluctuations in lake and river levels during the year of observations were determined, and the effect of lowering the lake level was approximately determined. When conditions are fairly permanent, it should be possible to determine the discharge at the section chosen with a fair degree of accuracy. There are many and frequent changes in lake level, and during the time such changes are taking place, the water of discharge must vary enormously, about an average approximating the discharge under permanent conditions. The general results may therefore be accepted as a close approximation to the truth. A study of the individual observations will show the fluctuations of the individual results, and a study of the attending conditions may indicate the reasons therefor.

From these results it is computed that the removal of 10,000 cubic feet a second from Lake Michigan for the Chicago drainage canal will lower the level of Lake Erie 0.4 foot.

Some of the Unsolved Problems of the Chicago River. An inspection of the Chicago river since the opening of the drainage canal shows that a number of problems remain to be solved before the action of the canal will be entirely satisfactory to Chicago. At this season of the year lake navigation is at a stand-still, and no large vessels are moving in the

river except to change berths or for other infrequent reasons. But even with no vessels, the handling of which will be seriously interfered with by a slight increase in the current of the river, it has been impossible to continue the full proposed discharge through the canal. This is largely due to the unprotected condition of some false work and temporary constructions about piers not yet completed, but some docks and bridge piers have been materially affected and will require early attention. The reversal of the current is, perhaps, as responsible for some of this as the increase in velocity. It is very evident that the handling of large vessels will be positively dangerous in some portions of the stream, even when the discharge is far below the ordinary flow proposed.

The remedy for this condition which first presents itself is an increase in cross section. Thus far there has been a positive decrease in cross section, especially near the entrance to the drainage canal, and the intakes for the pumps supplying the navigation canal must be lowered before they can furnish the supply required for the waterway. It seems hardly possible to widen the river on account of the vast expense of removing buildings and docks and rebuilding the latter. Much relief can be secured by removing the draw spans and substituting bascule or lift bridges. Some time is being lost here in discussion of the question of responsibility, the city claiming that the drainage district should pay for these reconstructions. Since the citizens of practically all of Chicago pay for the bridges in either case, this should not be permitted to interfere with the construction of works which the interests of navigation will demand at a very early day. The by pass seems to help in reducing the current where it is located, but there are several other points requiring similar attention. Increasing the depth of the river will aid by increasing the cross section and by giving better depth for vessels. This will require lowering the tunnels under the river, a measure which can not be delayed longer without seriously affecting the shipping interests of the city. While the lowering of the level of the water surface is not so pronounced at the tunnels as at Bridgeport, it is still noticeable at times and aggravates a condition already troublesome.

When there is copious rainfall the large increase in the amount of water in the river causes it to flow into the lake and renew the pollution of the city water supply. It would be possible to help in preventing this to some extent by opening gates at the controlling works and increasing the discharge, if the Des Plaines river were not swollen by the same rains. The conditions at Joliet are such that when the Des Plaines river fills up from floods the discharge from the canal must be diminished to prevent damage from overflow. Such damage would be attributed to the

canal at once, and would saddle great expense upon the drainage district. The completion of the work on the channel at Joliet now in progress will remove some of the danger, but further improvement there may be necessary. It is not probable that such improvements will be made until the question of the extension of the canal for navigation purposes is settled.

Another method of relieving the congestion of the river from storm-water is to put in another canal in the southern part of the city, and discharge the new intercepting sewers into this canal. The adoption and partial construction of the present system of intercepting sewers is in part opposed to this plan.

The north branch of the river is not as yet very favorably affected by the flow of lake water through the main river and the south branch. It may be found necessary to put in a pump to force lake water into this branch at a convenient point as far north as possible in the manner adopted at Milwaukee. Such a plan would increase the difficulties from lack of cross section in the south branch, and will not be adopted until some solution for these difficulties is decided upon.

These are large questions which are pressing for immediate solution. Until satisfactory plans are carried out it will be impossible to secure the full benefit of the canal, and at times it may be necessary to close the gates entirely.

Good Advice in a Report.

The report of the department of public works of Peoria, Ill., contains, in addition to the usual reports of work done, some excellent recommendations by City Engineer Thompson, which will be of much value to other cities considering like problems. They are eminently practical, drawing the logical conclusions from the results of actual construction.

A brief report on observations of the use of novaculite as a paving material gives full information upon all debated points and suggests the method of working the surface so that it can be made smooth and compact enough to permit sweeping.

A strong argument is made for compelling the completion of all work requiring trenching on the streets at least a year before a pavement is laid. It is applicable to cities having conditions similar to those in Peoria. It is possible, however, to lay a pavement with safety upon a surface which has recently been cut into, if the work of refilling the trenches has been done under careful inspection under a specification made to fit the materials actually found. Some materials are much more difficult to handle than others and scarcely any two kinds require the same treatment. The use of a roller of sufficient weight and proper form in preparing the sub-grade for the pavement is quite essential in proving the work of trench filling. Under ordinary conditions of contracts with gas, water and other corpora-

tions, and of inspection, the farther back the trenching can be set the better, but some soils are little, if any, safer after a year in which to settle, than they are on completion of the filling, if the work has not been done under suitable specification.

The argument for the improvement of a main road leading into the city in a permanent manner is a good one. It is shown that a permanent improvement would cost from $15,000 to $20,000, while the city pays annually for repairs on the present roadway at least $1,000 a year, the interest on a capital of $25,000. The improvement would, therefore, pay for itself and for its repairs, leaving a balance of profit of large dimensions where the possibility of hauling larger loads, the reduction in wear and tear of vehicles and horses, the time saved, are all considered.

An argument for inspection and construction of sewer connections is made; also an excellent one for control of plats of additions to the city.

City engineers who want good arguments on these questions to present to their city officials will do well to secure a copy of the book.

Garbage Disposal for Small Cities. In this issue appears an article describing the unique treatment of garbage in Moline, Ill., its efficiency and economy. The plan, in short, is to dump the garbage from the special wagons in which it is collected into a large shallow box with bottom sloping down to a channel, from which it is separated by a rather close wooden grating. This channel is connected with the sewer. The water in the garbage quickly drains into the sewer. A stream of water under hydrant pressure is turned on the box and the garbage is thoroughly washed, also the box and the wagon. The portions easily disintegrated and all the fine material are washed into the sewer, leaving a relatively small amount of washed material, which is shoveled into a cart, carried off and buried. The garbage of Moline, of over 20,000 inhabitants, is all systematically collected, much of it being deposited by householders in water-tight cans, so that there is much water in it. It is stated that the remainder from an entire day's collection is about one cart load, an amount which can be cheaply disposed of by burial. The method is certainly unique and seems to be sanitary and satisfactory in all respects. There is no nuisance about the shed in which the work is done since it is washed perfectly clean so frequently, and as many as are desired can be located wherever sewer connections can be made.

Double-Decked Street Cars. Perhaps the most prominent difference, to the ordinary observer, between English and American practice on street railways, is the common use of double-decked cars in England and their almost entire absence in this country. The cars exhibited at the World's Fair by the Pullman

Company, though apparently all that could be desired, failed to be accepted and no other serious attempt to introduce them has been made. The reasons for the difference in practice are not very evident, aside from the inertia of established custom. From the operators' standpoint the double-decked cars would seem to be the more economical. A smaller and much lighter car is required to carry the same number of passengers, but slight additional weight being necessary to make safe quarters on top of the car. Thus a car carrying twenty passengers inside, carries an additional twenty-four outside, and weighs but little more than an "inside-seated" car with a capacity of twenty. A proper arrangement of stairways permits a single conductor to take care of all the fares, so that there is no expense for additional help.

Perhaps one reason for the difference in practice is found in the fact that the English conductor finds seats for practically all the passengers he admits to the car, while as many are admitted to our cars as can crowd in, so that the added seating capacity is not an actual addition to the capacity of the car, but even a restriction of it, on account of the floor space taken by the stairways. The most potent reasons may be found in the differences in climate. In winter, cars are heated in most of our northern cities, especially on long suburban runs, and in nearly all parts of the country an outside seat, for much of the time, is practically impossible. This cuts off three or four months' use of the outside seats. In the same way, our sun in the heat of summer is frequently too strong for comfort on the outside seats. When an awning is possible this difficulty can be obviated, by making this addition to the height and weight of the car. Between the two extremes, and leaving out rainy days, so few days of comfort are left, that the habit of using the English style of cars can not be formed. That they would be popular, should the weather permit, is shown by the patronage of outside seats in good weather, where they are provided, on the old Fifth avenue stages, in New York, for example.

CONSTRUCTION OF BRICK PAVEMENTS.*

By George R. Grimes.

The construction of a brick street means to a reasoning and intelligent people a public improvement for the public benefit. It means a good, durable, economical and highly sanitary public highway for wheeled vehicles. It means a perfect roadway for town and country.

Much depends, however, for the above conditions upon the character of the construction. It is an essential element, combined with good material. The one without the other will make only an acceptable highway, but combined produce, all conditions considered, the best public highway known.

But, since I am to deal with the manner of construction, I will respectfully submit the knowledge of my experience under the following heads.

*Condensed from paper read before National Brick Manufacturers' Convention.

First—The subfoundation, commonly called grading.

Second—The curb setting.

Third—Intermediate foundation of concrete.

Fourth—The sand cushion for the brick.

Fifth—The laying and rolling of the brick.

Sixth—The provision for the expansion and contraction.

Seventh—The filler for the interstices, commonly called grout.

There is much to say under the head of subfoundations, or the preparation of earth for the reception of the balance of the structure.

The character of the soil, whether it be sandy or clayey, is of little consequence, as it is essentially necessary in my judgment to have all pavements impervious, then the subfoundation is but little, if any, affected by the element that makes bad roads—moisture.

Importance should be attached to the determination of the contour, or the curvature of the road bed, giving it as nearly as possibly a plain surface. The compacting by rolling with a steam roller should be well and thoroughly done. This is accomplished best with a roller weighing not less than five nor more than eight tons; one between the two, in my judgment, is preferable.

If a twelve to fifteen ton roller is used contractors, as a rule, will not pass over the surface more than twice, and often but once. Specifications rarely name the number of times a subgrade should be rolled. My experience has taught me that a lighter roller passing many times over a subgrade gives better results than a few rollings by a heavy one, and gas and water pipes are in much less danger.

The prime factor in a finished subgrade is uniform density of the top stratum of earth. Estimate all soft places, so that all settlement (and there will be more or less) will be uniform; make the contour of the cross section as nearly perfect as possible; bring the condition to such perfection that you get the minimum amount of settlement, and then you are ready to apply the concrete.

Under the head of curb setting my practice has been, after the heavy part of the grading has been done, to have the curb all hauled and distributed in the roadway along the curb lines. The trenches should be dug to the proper depth, allowing always for a foundation of some kind, either gravel or broken stone eight inches in depth or concrete mixture six inches in depth. It goes without saying that the concrete is always the best, but a curb can be well and substantially set on gravel or broken stone. With whatever material, it should be reinforced in the rear with a wall of the same, six inches thick, and up to within four inches of the top. The essential points to observe are perfect alignment, perfect surface elevation and thorough tamping. With these items well maintained the sidewalk curb is well set. The marginal curb, that which sustains the pavement against the unpaved opposing street, or at either end of the paved streets, should always be set on a concrete foundation, as I have found this to be the only means to prevent the settlement of same, occasioned by the pounding received by vehicles from an unpaved street.

The marginal curb should always be dressed on the top and four inches down on the inside, and set to conform accurately to the curvature of the street. After the curb is set, finish the subgrade, using the top of the curb as a constant guide in this finishing process. Now comes the application of the concrete mixture, and, in my humble opinion, all permanent pavements should have concrete substructure, either of screened gravel or crushed stone. For the brick pavement either, in my judgment, is highly suitable.

The generally accepted manner of mixing sand, cement, stone or gravel, as given by the best authorities, needs no comment here.

The platform for mixing should be of metal, 10 feet by 12 feet, 3-16 to ¼ inch thick, mounted on two oak runners about 3 by 4 inches, one on either side, flush with the edges, with suitable handled chains for drawing forward. When in position for service the center of the platform will lie flat upon the subgrade, making smooth wheeling for the barrows of material.

Before applying the concrete on the subgrade stakes should be driven, marking the top of the same, not over five feet apart, both parallel with and at right angles to the curb line, checking the whole surface of the subgrade into five-foot squares, with a stake at each corner of the same. By this means the tamper will have but little difficulty in maintaining the true contour of the cross section, and insuring a parallelism between the subgrade and the concrete. This I deem of much importance. Each section of the work from the subgrade to the brick course should have as nearly parallel surfaces as it is possible to make.

To mix the concrete, the sand should be evenly spread over the platform, and for the best results should be clean, snarp and dry;

then add the cement, spreading evenly as in the case of the sand. Mix in this dry state thoroughly, or until the whole shows an evenly colored mass, free from all streaky appearances; then add sufficient water and thoroughly mix until the mass attains a consistency which will readily subside of its own weight when thrown into a cone-shaped heap; now add the dampened stone or gravel, and turn the whole mass over with shovels at least three times, receiving its fourth turning when carried from the platform to the place of deposit, which should be done with shovel, too. Some laborers become very expert at this work, as there is quite a sleight in turning it over while casting it from the shovel to its proper position. When a gang of men acquire all these details the work progresses rapidly and satisfactorily in this manner. I have had no experience with machine mixing.

The tamping of the concrete is best accomplished, in my opinion, with a wood tamper, made of a piece of oak timber 8 or 10 inches square, and about 8 inches long, with a round handle inserted in one end about 5 feet long. Nail to the bottom a piece of 1½ or 2-inch oak plank, which can be removed when it becomes worn and rounded at the edges, and a new one put on. In proper hands this will leave the concrete showing sufficiently free mortar and a smooth top surface for the reception of the sand for the brick cushion.

The concrete thus applied should remain undisturbed from 48 to 60 hours before proceeding with further construction. In extremely dry and hot weather an occasional sprinkling is of much benefit.

The sand for the cushion, in my opinion, should be of a soft, velvety nature, free from foam and all foreign matter; yet a sharp sand can be used, but I imagine the soft sand will receive a fuller impression of the brick and give a better cushion.

The spreading of this sand, or bedmaking, as it is commonly called, is of much importance, and should be scientifically done, and not delegated to the eye of a laborer with a hand screen, but a template made conforming to the true curvature of the cross section of the roadway, the full width of the roadway if under thirty feet; if over thirty feet, use the same for one-half the roadway. This template can be made of a light wood two inches in thickness and of sufficient width to admit of forming the proper curvature and of required length, either for the whole or half the roadway of the street. If for the whole of the roadway, if under thirty feet, it must be sustained by stay and truss rods to keep it from bending and sagging. Each end must be armed with a cross head with two metal rollers, mortised in to carry it along the top, and one in the end to carry it away from the curb. If using only one-half of the width of the street, the center to roll on a 4 by 4-inch piece and 10 or 12 feet long, set carefully to grade and line. The template may be drawn by man or horse. A device of this kind not only insures a perfect surface to the sand for the reception of the brick, but compresses it more evenly than the hand screened method.

The foundation now being prepared for the brick, I know no better method of laying them than perpendicular to the curb line, except at street intersections. Here the best plan in my judgment, is to start at the intersection of the center line of the two streets, and lay at an angle of 45 degrees toward the curb corner, making a triangular shaped section of the four quarters, closing them against the prependicularly laid brick on the curb line of the two streets.

The most economical way of getting the brick to the men who lay them from the piles along the curb lines at either side of the street (where they must be deposited previous to the grading of the roadway) is by wheelbarrows on planks at all times, never allowing them wheeled over the bare brick, as it settles the brick in single rows, when wheeled lengthwise, or a single line of depression when wheeled crosswise, and then, when the process of rolling takes place, these impressions are hard to completely remove.

To maintain a close contact of the brick throughout the whole work the barrows, before dumping, should be turned perpendicularly to the alignment of the track, and tilted with the brick slide gently out toward the curb. If dumped otherwise there is a continued widening of the joints and a disturbance of the alignment of the rows of brick, which, for their entire length, should be perpendicular to the curb, or as nearly as can be made so.

The work is now, after being swept clear of all bats and spalls, ready for the steam roller, which should not be less than four or more than six tons in weight, but one between is preferable. Start the roller at the center of crown of the street, and roll back and forth until the curb is reached, avoiding too close contact with same.

The passing of the roller should not be faster than a very slow walk, thus avoiding giving the brick a careened position in the sand cushion, which will invariably follow

if the first passage of the roller is too fast, and is subsequently very hard to remove. After the brick have been thoroughly imbedded in the sand cushion by the slow process of rolling, the speed of the roller may be materially increased.

When this longitudinal rolling has been fully accomplished commence at either end of the thus finished work and pass the roller transversely over the brick at an angle of forty-five degrees from curb to curb; repeat the same work, commencing at the opposite end of the brick, and pass across in the opposite direction. Before rolling begins, however, the brick should be thoroughly inspected and all defective ones removed and replaced by perfect ones. Under the head of expansion and contraction my experience has been less in the effort to overcome it than in the observance of its effects. These defects all are no doubt familiar with.

The greatest and most unpleasant sounds coming from a brick pavement are due to expansion, and are heard in midsummer when the brick reach their maximum, and are caused by a lack of contact between the brick and sand cushion, occasioned by the resistance of the curb at either side of the roadway not being sufficiently great to arrest the lateral expansion in elevating the crown of the street, and thereby disturbing the contact between the brick and the sand cushion; then following the wheelage, the rumbling sound, which may be readily avoided by applying between the ends of the brick and curb on either side of the roadway a cushion of asphalt or No. 6 pitch, applied in the liquid state. This, in my opinion, is all the provision necessary to overcome the objectional feature of expansion, except that all brick should be laid during a summer temperature; the individual brick is then at practically a maximum expansion. In applying the elastic bond above mentioned between the ends of the brick and curb you prevent the brick work from bonding with the curb, as it will necessarily do with the cement filler, thereby allowing the longitudinal expansion freedom of action which will expand itself at the ends of the street, or vibrate back and forth, doing but little damage; however, this is somewhat theoretical.

Now we come to the filler, which is, in my opinion, the most important element connected with the construction of a brick pavement, and on which depends the beauty, durability and life of the structure. In my judgment, the cement filler is the best, and none other should be used. The mixing and application of the cement filler needs the most careful and intelligent attention. It is presumed, of course, throughout this whole discussion that the very best materials only are considered, as they are essential elements in all good work. The sand entering into the mixture should never be other than clean, sharp and dry, and in that state mixed with an equal part of Portland cement until the mass assumes an even and unbroken shade. In other words, thoroughly mix until each individual grain is completely coated with the cement, then water enough added to make a liquid mixture of the consistency of very rich cream, and from the time the water is applied until the last drop is floated over the brick kept in constant motion, never allowing the mixing to rest.

This process is most rapidly done with a good-sized hoe. To do this successfully I provide a box three and a half to four feet long by twenty-seven to thirty inches wide and fourteen inches deep, resting on legs of such different lengths that will float the mixture readily into the lower corner of the box, which should be about eight to ten inches above the pavement. To remove this liquid from the box use an ordinary scoop shovel, casting its contents before the gang of sweepers, who are armed with ordinary warehouse brooms, immediately sweeping the mixture into all joints. It should be applied in two courses, the second course being mixed a little thicker than the first. After the application of both courses and the work has progressed say fifteen or twenty yards, the force should be turned back, accompanied by a man with a large sprinkling pan, the rose being perforated with very small holes, gently sprinkling the surface ahead of the sweeper. This last sweeping fills up all places that may have been left after the first process, and fills joints which have shrunk and settled below the surface of the brick. It is advisable to then cover the finished work with a light coating of sand, and in very dry and hot weather an occasional sprinkling with a garden hose is necessary. This finished, the work should never be subjected to any disturbances, and not open for traffic for from seven to ten days after completion.

I have secured some superior construction in following the general line of the foregoing paragraph. Of course there are many minor details presenting themselves constantly as work progresses which need intelligent care and attention. Brick streets

have not attained their proper and justly deserved position in the category of public highways for the simple reason of faulty construction. If the standard of construction had kept pace with and advanced hand in hand with the high class of material (I especially refer to paving brick) we have today, there would have been no question as to the kind of material cities would today be specifying for their highways, as, in my judgment, all others save brick would have been relegated. And, gentlemen of the convention, the day is not far distant when vitrified brick will reign supreme as material for public highways, and, not stopping there, will supplant all others for building purposes.

REVIEW OF LEGAL DECISIONS AFFECTING MUNICIPALITIES.

[By C. W. Tooke, A. M. LL. B., for MUNICIPAL ENGINEERING.]

Right of City to Discharge Sewage Into Running Stream.

In the January number we had occasion to make some comments upon the decision of the supreme court of Indiana in the case of the City of Valparaiso vs. Hagen, in which the court refused to grant an injunction against the pollution of a running stream by sewage and set up the novel contention that the city as a riparian owner possessed peculiar rights under which it might maintain the nuisance in question. On Jan. 4 the supreme court of errors of Connecticut passed upon a similar case in Platt vs. City of Waterbury (45 At. R. 154), and therein disposes of the grounds upon which the Indiana court based its decision by a simple statement of the general principles that govern such cases.

The facts of the latter case are that the plaintiff owned an ancient water privilege on the Naugatuck river, below the defendant city, and also land on the river and large manufacturing establishments run by water power. The river has for many years been used for purposes of surface drainage for a thickly populated district and the water was thereby rendered unfit for primary uses, but about the year 1884 the defendant constructed, under authority from the legislature, a system of sewers, with a discharge into the stream, whereby the water became heavily polluted, so that it was unfit for manufacturing purposes and the health of the plaintiff's employes was endangered by the noxious odors arising therefrom. The defendant claimed that its use of the stream was a reasonable use, justified by the fact that the water of the river had been for an indefinite period given up to secondary uses. But the court asserts that whether or not such a use is reasonable is a question of fact, depending largely on the circumstances of each case. "The use of a stream," says the court, "for drainage may under some circumstances be reasonable, although the water is thereby rendered unfit for primary use; but the concentration of the filth accumulated by one proprietor, whether an individual or a municipal corporation, and its discharge into the river in such quantities that it is necessarily carried to the premises of another, where it produces a nuisance dangerous to his health and destructive of the value of his property, must be unreasonable. If the defendant has, as claimed, a prescriptive right to pollute the river in the manner used prior to 1884, that right does not justify it in further polluting the river by an additional and different use; and the defendant cannot acquire by any prescription a right to maintain a nuisance like that described in the finding."

Another contention of the defendant was that the use of the sewers under the authority of the legislature in the manner described is a public governmental use; and that, therefore, the consequential damages resulting therefrom give the victim no remedy against the agent of the state, except so far as provided by statute. The court shows clearly that in the case at bar the city was not acting as the mere agent of the state, but that the powers granted were in the nature of a privilege primarily for the personal benefit of its inhabitants. But the court holds further that if the claim is conceded that the use is primarily a governmental use, still the defendant must be held liable, on the ground that the injury described is not a mere consequential damage like that resulting wholly from the lawful use of one's own property or the lawful exercise of governmental power. It is, in fact, a direct appropriation of well recognized property rights within the guaranty of the constitution, which provides that the property of no person shall be taken for public use without

just compensation therefor, even if we admit that the sewage of a city may be discharged into a running stream in such quantities as to injure the property and health of lower riparian owners, when authorized by the state, yet this is justifiable only on payment of compensation for the property thus taken.

The Indiana decision referred to, while supported by other decisions in that state, is certainly the expression of very vicious principles of law. Even in England, where there are no constitutional guarantees applying to such a case, the courts have held that they cannot countenance the monstrous injustice of thus appropriating the property of riparian owners without just compensation and without due process of law. It is to be hoped that the Indiana court may be induced to qualify its position in this matter before the federal courts are called in to give to the aggrieved property-owner that protection which is refused him by the courts of his own state.

Special Assessments Under the Barrett Law.

We have before us the full text of the decision of Judge Baker in Charles vs. city of Marion (98 Fed. R. 166), in which the circuit court for the district of Indiana granted a temporary injunction to the complainant and incidentally expressed its view of the force to be given to the case of the village of Norwood vs. Baker. The court says that in none of the cases in which the special assessment law of Indiana has been adjudicated by the supreme court of that state has prominence been given to the question ruled in Norwood vs. Baker. "The principle there settled is that a property-owner cannot be assessed for the construction of a public street or alley in excess of the amount of benefits conferred upon the property, and that such benefits are those only which are peculiar to the property and do not embrace benefits derived from such public improvement by the landowner as one of the public at large." Judge Baker doubts whether there is any provision in the statute that provides a tribunal and clothes it with power and points out the method of its procedure for the purpose of ascertaining the benefits actually received by the property of the landowner by the construction of a street improvement. While the judge agrees to the proposition that it may be possible for the supreme court to import into the statute a power in the common council or in some committee of that body to hear evidence and to determine the amount of benefit to the abutting property, he holds that such a construction would amount to judicial legislation, and that in the absence of a decision by the highest court of the state upon that point, the threatened injury to the plaintiff is good ground for granting a temporary injunction. Thus the decision of Judge Baker is in direct line with that of Judge Philips of the southern district of Missouri in Fay vs. city of Springfield. (See Municipal Engineering February, 1900, p. 100.)

Private Sewers—Taking Property for Public Use Without Compensation.

The appellate division of the supreme court of the State of New York has reaffirmed in the recent case of Wright vs. City of Mt. Vernon, (60 N. Y., Sup. 1017,) the right of compensation of private owners for sewers constructed by them and afterward taken or destroyed by the acts of a municipality in the construction of a general sewer system. The subdivision upon which the sewers in question were constructed was at the time farm land, which was laid out into building lots and improved by the plaintiff. The system of sewers for the subdivision was entirely independent of that of the then village of Mt. Vernon, and was constructed wholly at the expense of the plaintiff and for his own benefit. Shortly afterward he sold off several lots and opened certain streets and avenues to the public through the property, and thereby dedicated them as public highways. In 1892, four years after the construction of the sewers and the opening of the subdivision, the section became part of the city of Mt. Vernon by the act of the legislature. In 1897 the defendant city undertook the work of constructing a district trunk sewer in certain of the streets and avenues of the addition, and in doing so it became necessary to remove or render useless the private sewer of the plaintiff.

The defendant claimed that by the dedication of the streets to the use of the public, the plaintiff had lost his property rights in the sewer system constructed therein. But the court holds that by none of these acts did he part with the fee to any part of the lands that he originally owned, and that even conceding that the streets were accepted by the public by user, this would not operate to take from the owner of the fee any right not inconsistent with the use of the streets or aveage or repassage over the surface. Subnues by the public for the purpose of pass-

ject to the easement of passage by the public, he retained all rights of property in the land, and had a clear right to construct a sewer system therein, which was his private property for all intents and purposes. The defendant city therefore had no right to take or destroy the property in question without just compensation. (See also Cohoes vs. Canal company, 134 N. Y., 397, and Buffalo vs. Pratt, 131 N. Y., 293.)

Liability of City to Contractor for Delay.

In Mairs vs. the mayor et al. of New York (62 N. Y., Sup. 351) a bridge contractor sought to recover damages occasioned by the delay caused by the presence of a large iron pipe carrying water from the Westchester water works across the Harlem river to City island, which pipe was located at a plac ewhere the contractor was required to sink one of the cribs for the required bridge. The pipe was there by the express permission of the city, and the contractor had no legal right to interfere with it. The defendant city set up the claim that the pipe was one of the unforeseen obstructions, respecting which the contractor took his chances, but the court held that it was not an obstruction removable by him, but one that was legalized by the defendant so far as its permission could legalize it. The contractor would have been liable as a trespasser, and his contract neither authorized nor justified illegal acts on his part. The defendant, after notice that the pipe prevented the contractor from proceeding with his work, was bound to revoke its permission to the water company, or make some provision for the protection or removal of the pipe so that the contractor's work could proceed. The city was, therefore, held liable for the damages resulting from the delay after the contractor had notified the city officers of the obstruction.

Liability of City on Express Contract for Lighting.

A recent decision of the court of civil appeals of Texas gives us a good example of a case in which a lighting company may not recover for services rendered as on an implied contract (El Paso Electric Power company vs. City of El Paso, 54 S. W. R., 798). As a general rule, a city which accepts the benefit of services for which there can be no recovery on an express contract may be liable for what the services are worth on an implied contract to the same extent as an individual or a private corporation. In the case in question, however, the contract provided that the company should furnish such lights as the city might designate to be placed at such places as the city through its city council might direct. To make this contract effective it was essential that the city should make the designation, and until such action was taken by the city authorities there existed no mutuality of contract between the parties. The city council not only failed to designate the number and place of the lights but absolutely repudiated the contract. The city had been using a number of the lights of the company and the company, notwithstanding the action of the city in giving notice that no more lights would be taken, continued to furnish light through the old lamps. The company was therefore held to be acting at its own risk and no recovery was allowed for the service rendered by them after the expiration of the old contract. (Compare with Municipal Engineering January, 1900, p. 40.)

Paramount Right of The Public in the Streets.

The supreme court of Alabama in the City of Mobile vs. L. & N. railroad company (26 S. R. 902) sustains the right of the public to the streets against their obstruction by the authorization of the municipal officers in the absence of a legislative grant. The railway company in this case, acting under certain grants of the city council, appropriated lands along the water front to the extent of depriving the public of the use of the river end of five of the principal streets. The court reviews a long list of authorities upon the doctrine that in a legislative grant to municipal corporations such powers as are not expressly or by the clearest implication granted are taken to be withheld, and unless the power be clearly or unequivocally expressed in the charter or conferred by statute, such a corporation cannot authorize a use of its public highways by persons or corporations in a manner that will interfere with the use thereof by the general public. For better reason, a city council does not have an implied power to authorize the closing or appropriating of its streets by a private corporation. As there was no direct legislative act in this case, the possession of the streets in question by the railroad company is decided to be without legal sanction; but the court reserves an expression of opinion upon the question whether even the legislature could confer the power upon the city to deprive its inhabitants of the use of the streets to the extent set forth in the present case.

CURRENT INFORMATION.

The Legal Rights of Contractors.

The Pennsylvania Supreme Court rendered a decision recently in a suit which has been in the court for years, involving the legal rights of contractors. In June, 1891, James H. Harlow & Co. made a contract with the borough of Homestead, Pa., for the construction of a reservoir, agreeing "to do all the work and furnish all the materials called for by this agreement, in the manner and under the conditions hereinafter specified." The nature and kind of work to be done and the materials to be furnished were set forth in detail in the terms of the specifications. The work was completed in about a year afterward. In July, 1892, the engineer furnished an estimate showing that the amount due the contractors, but still unpaid, was $20,553. The borough held back $2,000 from this amount because the reservoir was not finished. The reservoir leaked, but the contractors held that the leakage was no fault of theirs, for they had followed the plans, specifications and engineer's directions, and any failure of the reservoir to hold water was to be ascribed to them.

When the case was tried in the court of common pleas of Allegheny county the contractors' case was considered so strong that the jury was directed to find a verdict for them, subject to a legal question which the court reserved for its own decision. The borough appealed from this decision on two claims—first, that the evidence did not show the contractors were entitled to be paid, and second, that the judge had no right to direct the jury to bring a verdict. Under the first claim it was held that the contractors were bound to make a tight reservoir. The supreme court rejected the contention. The specifications say that "the work contemplated is the construction of a water-tight reservoir," and the engineer who drafted them evidently thought they would produce such a result, but the contractors assumed no such responsibility. Their agreement was to carry out certain plans and specifications, and if they had done so when the suit was brought, the money due them cannot be withheld because the results of their work are not what the engineer hoped for. The supreme court held that the case was the same as in the suit over the noted Queen Lane reservoir in Philadelphia, 37 Atl. Rep., 546, which held that "the contractors were given no discretion. Every line was drawn, every grade was fixed and every detail was provided for by the city."

The supreme court overrules the contention of the borough that the $2,000 was not due until the engineer filed an estimate to that effect. The supreme court holds that the money is due when the work is finished, whether the engineer says so or not. It is for the jury to decide whether the work was completed. The case has been sent back to the trial court to be tried anew. The reason for this is that the judge of the trial court did not allow the jury to settle the question, but ordered it to bring in a verdict subject to a legal question which the court reserved for its own decision.

Judgment for the Value of Water Works.

A verdict was returned Feb. 8 by the advisory jury in the Mock case accounting at Santa Rosa, Cal. The supreme court ordered the accounting, and the case had been in progress more than a month before Judge William R. Daingerfield of San Francisco. The suit was brought by Wesley Mock against former Mayor E. F. Woodward and the former members of the council, who expended $161,000 in the construction of a water works system during their term of office. Wesley Mock charged fraud, misappropriation of funds and an inadequate system. The jury was only out twenty minutes when it agreed on a verdict to the effect that the value of the system, as accepted by the city, was $190,000, and that the actual value of the work done and the materials furnished by the contractor was $161,000, the amount of the bonds.

License of Electrical Workers in Cities.

In his report for 1899 City Electrician Schurig of Omaha, Neb., recommends the establishment of an examining board, composed of the city electrician, one contractor and one member of the Electrical Workers' Union, and that all wire men be required to take out a license. He further says: "A fire prevented does not need to be extinguished. The entire time of the city electrician being taken up with new work the necessary reinspection of old work to prevent fires, a strict inspection of all work, the work, in brief, required of the department, and which should be done, is not being done, and cannot be done, no help or assistants to do it being provided. This bad condition will become worse as the use of electricity increases."

Regarding the construction of underground conduits and street lights he says: "The trouble with our contract is not in the requirement to furnish 430 watts power to each lamp, but lies in the approval of proposals and contracts for lighting our

streets without submitting them to the proper department for criticism, and furthermore, in making it possible to enter into a contract without receiving bids upon specifications prepared for electric lighting."

Price of Gas Reduced at Haverhill.

The Massachusetts board of gas and electric light commissioners has rendered a decision in the application of the authorities of Haverhill for a cheaper gas rate, in which it recommends that the net price to be charged for gas supplied by the Haverhill Gas Light company, from and after the first day of February shall not exceed 80 cents a thousand feet.

Liability for Paving Between Street Railway Tracks in Iowa.

A decision was rendered by Judge Whitaker of the district court at Davenport, Ia., in the case of paving between the tracks of the street railway at Ft. Dodge, Ia. The petition of the intervenor against the city was dismissed, and the temporary injunction granted the railway company against the payment of the tax is made permanent. The city is absolved from payment of the tax. The certificates issued for the payment of the paving between the tracks are rendered null and void, and the tax cannot be collected from the street railway company or the city. The contractor loses the amount involved, about $2,500.

In reviewing the case Judge Whitaker called attention to the new paving law which went into effect in October, 1899, saying that had any of the paving been laid after the new law went into effect he would have held the railway company liable for its payment.

Illegality of Inequitable Assessments.

In an opinion handed down Feb. 5 by Judge Archibald in the case of the city of Scranton, Pa., against Hannah Levers, he decided that there is neither an equal assessment nor an even-handed dispensation of the law, which compelled one property owner to pay on two sides of her property, and another on one side, and as the error so committed is inherent in the assessment, it is vitiated to at least the extent of the excess and the city is not entitled to enforce it as it stands.

Value of Drainage Channel Water Power.

The installation of a plant to utilize the drainage channel water power would save the city of Chicago at least $1,000,000 a year, according to City Electrician Ellicott, who says: "The use of this power will enable the city to furnish 16,000 arc lamps to the streets. This number will be ample to light all the dark spots. The city will be able to run the engines at the pumping stations, swing the bridges and light the police and fire stations and the city hall. There will be a saving of 50 per cent. in the cost of fuel all around."

Public Work in Indianapolis.

The annual report of the board of public works of Indianapolis, Ind., for 1899 was submitted to Mayor Taggart Feb. 17. The improvements completed during 1899 are as follows:

	Miles.	Cost.
Asphalt	.96	$ 41,568 31
Asphalt (repaved)	.18	15,023 86
Brick	1.74	23,200 34
Wooden block	2.91	154,255 55
Gravel streets	5.31	79,276 92
Gravel alleys	2.81	7,295 17
Bowldered alleys	.21	932 40
Cement walks	10.54	97,215 89
Brick walks	1.59	5,325 00
Sewers	9.37	108,245 79
Levees	....	3,496 26

Several important sewers will be built during the ensuing year. One of the most important of these will be the E. Michigan-st. main sewer, notice of intention for which has been published. The common council has authorized during the year the issue and sale of bonds in the sum of $150,000 for building bridges. These bridges will be ready and open for travel during the summer months. Attention is called to the constantly increasing expense for repairing permanently improved streets. As the guarantee period on expensive public improvements expires the care of these improvements reverts from the contractor to the city. During the year 1899 the sum of $23,000 was appropriated for this purpose, of which amount $22,945.25 was expended, with some work necessarily left undone. The sum of $25,000 has been appropriated for the coming year. For cleaning permanently improved streets, including the pay of inspctors, $46,656.01 has been expended. The board recommends the making of a new contract with the water company.

The Metered Water Question at Jersey City.

The purchase of water by meter from the East Jersey Water company, and its subsequent sale to consumers at a scale of prices bascd on the size of houses or number of fixtures within them, is pronounced a very unbusiness-like procedure by Charles Van Keuren, chief engineer, in his recent

report to the board of street and water commissioners at Jersey City, N. J. The general introduction of meters is advocated by Mr. Van Keuren as a business proposition. He estimates that they would reduce the consumption of 21,000,000 gallons, which would yield an annual revenue of about $1,160,000, and reduce the sum paid to the East Jersey Water company from $400,000 to $276,000. Jersey City is now using 31,000,000 gallons daily. The introduction of meters and setting would require an expenditure of $575,000. The total annual disbursements under the new system, including operating expenses, interest account and payments for water would be $797,000, leaving a net balance of $363,000 for depreciation and profit, in addition to the really great benefits to be derived from habits of carefulness in place of carelessness.

Water Supply Investigation in Wisconsin.

The water supply of a large number of cities in Wisconsin is being investigated and the information secured will be embodied in a work to be issued by the state university. The data procured will relate to analyses of water, its hardness and source of supply—whether well, river, lake, spring or artesian well. The information is being secured by W. G. Kirchoffer, city engineer of Baraboo, Wis., who will make a thousand-mile journey. The list of cities included in his route are Madison, West Bend, Watertown, Fond du Lac, Oshkosh, Neenah, Appleton, Depere, Kaukuna, Green Bay, New London, Stevens Point, Grand Rapids, Wausau, Tomahawk, Rhinelander, Ashland, Superior, Rice Lake, Chippewa Falls, Eau Claire, La Crosse and Sparta.

A Question as to Taxation Raised by a Water Company.

The Metropolitan Water company, Kansas City, Kas., has enjoined the sheriff from serving a tax warrant for the collection of $2,223.26 personal taxes on the company's mains in Kansas City, Kas. The corporation has paid a personal tax to the city, county and state on its several miles of water mains in the city each year, but last year the company failed to assess them as personal property. When this omission was discovered by the clerk he placed the mains on the tax rolls again at the same valuation at which they had been assessed before. The clerk had the right to do this under the law if the tax is legal and was overlooked by the assessor. Before the tax was charged up, however, the water company had in the meantime settled its other taxes, including the assessment upon the Quindaro plant as realty, and when the treasurer informed it that there were more taxes against it the corporation's attorneys insisted on not paying the amount. The warrant was issued and placed in the sheriff's hands. Judge Holt of the court of common pleas issued a temporary restraining order and the warrant will not be served until the court has had time to consider the matter.

Proposed Legislation Affecting Water Supply in New York.

Water companies in the state of New York seem to have made a concerted move to acquire additional rights by legislative enactments. Bills have been introduced to give corporations authority to construct huge dams along the Hudson river, and there are schemes to establish reservoirs in the Adirondacks. One bill provides for the establishment of reservoirs along the Racquette river, in the Adirondacks, at state expense, and does not prohibit the use of the waters stored up by individuals. A similar bill was defeated in the Assembly last year on the ground that it was unconstitutional, and from the opposition to the measure that is displayed now it is not believed that it will pass this year.

Trouble Caused by Paris Sewage Farms.

A vigorous protest is being raised against the new sewage farms near Paris. The sewage seems to escape between fissures in the soil into subterranean sources of supply to the wells, with the result that local wells are infected and there exists an epidemic of intestinal troubles.

Plans for Reclamation of Lands at Newark, N. J.

The plans for reclamation of the meadows in Newark, N. J., are being considered by Ernest Adam, city surveyor. The plans, thirteen in number, were submitted in July, 1899, in answer to advertisements for methods of reclamation published by the board of street and water commissioners, which acted in conjunction with the board of trade in the collection of a purse of $1,000 to be divided into three prizes of $500, $300 and $200 for the three best plans. The cash was deposited with the street and water commissioner and is still in their custody. The plans submitted were from experts and engineers from all parts of the country. The report will be made before the coming summer, so that if there is any possibility to doing so work may be commenced during the present year.

Bonds for Sewer Construction in Indiana.

The Indiana appellate court rendered a decision Feb. 21, in which it held that the common council of a city which levies a sewer assessment on property belonging to an owner, who takes advantage of the Barrett law, is not bound to issue bonds for the assessment, payable in annual installments during a period of twenty years. It may make the bonds to run only ten years, and require the assessment to be paid in ten annual installments. This opinion, which reversed that of the lower court was rendered in the case of the People's national bank against Maria L. Ayer. The appellee owned a lot in Hammond, Ind., which was assessed for the construction of a sewer.

Legal Requirement of Publicity of Contract Lettings.

In a suit of the S. D. Mercer company against the city of Omaha, Neb., to annul a special sewer assessment for the Cuming street sewer amounting to about $3,000, Judge Dickinson decided against the city in an opinoin on Feb. 5. He is of the opinion that the law requires notice of the sitting of the city council as a board of equalization, to be published in three papers of general circulation, while in the present case one of the papers was a German paper. Judge Dickinson said all the decisions of state and federal courts on this point are uniform in holding that a paper published in a foreign language is not eligible for the publication of such notices. It is believed that this decision, if sustained, will cost the city quite heavily, as other property owners in the same district will refuse to pay for the improvement.

Law Compelling Sewer and Water Connections.

A decision was rendered Feb. 10 in the suit by Adam Baker against the city of South Bend, Ind., to enjoin the city from collecting the cost of sewer and water connections with his property on S. Michigan-st. These connections were made before the permanent brick pavement was laid, in order to prevent the tearing up of the pavement. The law authorizing municipalities in Indiana to order the making of connections before a street is permanently improved, was drafted and enacted in 1893. This law was sutained by Judge Hubbard in his decision in the above case.

Compelled to Pay for Paving.

The Wisconsin supreme court handed down a decision Feb. 1, in a paving case in which the plaintiff refused to pay for paving in front of her property, alleging that the city of Beloit had no authority to compel her to pay and that the proceedings were unconstitutional. The supreme court decided in favor of the city.

Too Much Economy in Street Lighting.

The economy plan in the lighting of the streets of Bay City, Mich., is being worked a little too strong, according to recent press reports from that city. The Tribune recently said:

"The manner in which the streets of Bay City are lighted (or rather not lighted) has ceased to be a subject of humorous mention and should be given some consideration by the common council. The city has an expensive lighting plant, but for at least one-third of the month the people who pay taxes for the support of public institutions do not realize that fact, especially if they have business which takes them upon the streets at night. It is time to call a halt and light the streets after the manner of modern up-to-date cities."

Demand for Water Filtration at St. Louis.

On invitation of the Engineers' Club of St. Louis, Mo., about fifty citizens, including representatives from twenty-one local organizations, met to discuss the water question. A citizens' committee on water filtration was organized, with C. H. Huttig as president, M. L. Holman, M. Am. Soc. C. E., as one of the vice-presidents, and Mayor J. L. Van Ormun as temporary secretary. Dr. Amand Ravold, city bacteriologist, referred to the typhoid epidemics of 1898 and 1899. Both epidemics, he said, followed periods of low water in the Illinois and Missouri rivers. He said that at times of high water the bulk of the supply is really Missouri river water, but when the water is low the main stream of the Mississippi is drawn from to a greater extent, and thus more Illinois river water is taken. He strongly condemned the Chicago drainage canal. Resolutions were adopted by the joint committee to the effect that the river water is "'frequently turbid and is becoming increasingly polluted; that filtration is feasible and efficient; that an unobjectionable water supply is desirable before the 'World's Fair' is held in St. Louis; that the water should be filtered; that steps be at once taken toward investigating methods of filtration by the Board of Public Improvements and Municipal Assembly, and that the city authorities be requested to take steps, based on these investigations, to speedily secure for St. Louis the most efficient and economical system of filtration."

Street Paving Restrained in Rochester, N. Y.

The decision handed down by Judge Davy Feb. 3 on the proposed asphalt paving for Ames-st., from Jay-st. to West-ave., Rochester, was adverse to the city. It denies a motion brought to vacate a temporary injunction restraining the city from making the improvement. The suit was brought by Balthaser Stock, a property owner, against James Johnston, James L. Whalen and Oscar Knebel, individually and collectively as members of the former executive board. The plaintiff asked for a permanent injunction on several grounds, but the most important were that the ordinance which was passed by the common council on Nov. 28, 1899, did not indicate what kind of asphalt should be used, but left this to the discretion of the executive board or contractor; that it did not indicate how deep the base for the pavement was to be; that the city engineer and executive board, under the terms of the ordinance, can alter the pavement and thereby increase the expense to the taxpayers; that the majority of the residents of Ames-st. are small taxpayers and cannot afford to pay for the improvement. Judge Davy holds that the ordinance authorizing the improvement is void, because it delegates to the executive board and the city engineer discretionary powers pertaining to the character of certain parts of the improvement which, under the city charter, belongs exclusively to the common council. In a decision handed down Feb. 9, by Judge Davy, in an action by Levi Adler to prevent the city from laying a pavement on Flower City park under an ordinance adopted by the former common council, he again holds against the city on the grounds that the facts stated by former Corporation Counsel Kinney were insufficient to sustain the action.

Damages from the Discharge of Sewage Into a River.

The supreme court of errors in Connecticut has recently sustained the action of a lower court in granting an injunction prohibiting the discharge of sewage from the city of Waterbury into the Naugatuck river April 1, 1902. It is presumed that this time limit was set with an idea of giving the city opportunity for providing some other means of sewage disposal. The city's counsel contended that the use of the sewers to discharge their contents into the Naugatuck was "a public governmental use." The injuries to the plaintiff resulted from the governmental use, and were not direct, but merely consequential; "the victim of consequential injuries resulting from a governmental use is entitled to no remedy unless one is given by statute." The city's charter provided no remedy for consequential injuries resulting from the use of these sewers, hence "the plaintiff had no remedy, and his damage was damage from which no recovery was possible."

The supreme courts holds that the premises essential to this conclusion are neutral. The mere grant of authority to a city to carry off its refuse matter into some convenient stream does not necessarily make such use of it "a governmental use." Even if it did, the resulting injury is not a mere "consequential" damage, but a "direct appropriation of well recognized property rights within the guaranty of the constitution, for which the city is liable to the plaintiff." The city's counsel pleaded that a drainage system for its storm water must necessarily be used in course of time to carry off sewage. On this point the court says: "The right to pour into the river surface drainage does not include the right to mix with that drainage noxious substances in such quantities that the river cannot dilute them nor safely carry them off without injury to the property of others. The latter act is in effect an appropriation of the bed of the river as an open sewer, and the proposition that it may become lawful by reason of necessity is inconsistent with undoubted axioms of jurisprudence. The appropriation of the river to carry such substances to the property of another is an invasion of his right of property. When done for a private purpose it is an unjustifiable wrong. When done for a public purpose it may become justifiable, but only upon payment of compensation for the property thus taken."

A City Restrained from Establishing Water Works.

A decision was handed down by Judge Bell in the case of the Tyrone gas and water company vs. the borough of Tyrone, Pa., et al. in which he makes perpetual an injunction restraining the borough from purchasing and establishing its own water works. Judge Bell holds that the water company holds an exclusive water privilege in that borough that cannot be taken away without compensation. He points out that the municipal authorities have the right to purchase the private water plant by proper proceedings. The council will take an appeal to the supreme court.

Cost of Repairing Macadam Roads.

In his annual report for 1899 James H. MacDonald, State Highway Commissioner of Connecticut, discusses road improvements as follows:

"The folly and the great waste of public money in the methods of repair on macadam roads in some places must be apparent to all. I have seen a macadam road neglected so long that deep pockets and ruts appeared all over the surface, making it necessary to break up the entire surface with a steam roller with steel points on the wheels, and resurface the entire road. Such a necessity should never have existed and such a course of treatment would not have been necessary had the road been treated when it first began to show signs of wear. It has been said that macadam is very expensive to take care of. I do not think that this is of necessity so, if macadam were treated at the proper time and in the proper way. Not only should the state have the right to order repairs to be made but also the right to say how the repairs should be made and the material to be used. I have already seen some of the state roads covered over with a mixture of loam and gravel from four to six inches deep; such a treatment will result in from four to six inches of mud in the fall and spring, and from four to six inches of dust through the hot summer season. The old principle used in budding of seed fruit on seed fruit and stone fruit on stone fruit is the same principle to apply in the matter of material to use in repairing roads; stone on stone for macadam, and gravel on gravel, for they do not take kindly to the misalliance."

Improvement of New York Canals.

Governor Rossevelt submitted to the New York legislature with his approval, the report of the special committee on canals. Governor Roosevelt appointed, March 8, four prominent citizens of New York to act with Maj. Thomas W. Symons, corps of engineers, U. S. A.; Edward A. Bond, state engineer and surveyor; John N. Partridge, superintendent of public works, as a special committee to investigate the condition of the state canals and to report on the proper policy to be followed in improving them. The citizens appointed on the committee were Gen. Francis V. Greene, chairman, and George E. Greene, John N. Scatcherd and Frank S. Wetherbee. The committee proposes three plans:

1. To complete the canals much on the line of what was intended in 1895.
2. To make them ship canals.
3. To adopt an intermediate course.

Governor Roosevelt calls particular attention to that portion of the committee's report in which it sets forth that the efficiency of the canal depends upon their management quite as much as upon their physical size, and that there should be no further money spent upon them unless by measures which will secure their management upon an absolutely business basis. The measures are:

First. To improve all restrictions as to the amount of capital of companies engaged in transportation, so as to encourage instead of hampering the development of those modern business methods which are largely the foundation of our present prosperity.

Second. To provide for mechanical means for traction and the use of mechanical power in the place of hand-power in the locks.

Third. The organization of the force on a permanent basis so as to afford a guarantee that the entering into the service of applicants, their tenure of office and promotion will depend solely upon their fitness. This I consider a recommendation of vital importance. We must make it possible for young engineers to enter into work on the canals as they would into any other career, and the ordinary laborers and the like should be employed only when they show themselves presumably fit for the work, and should be kept so long, and only so long as they render efficient service, being promoted, reduced or dismissed strictly in accordance with the capacity, industry and good conduct of which they give proof. There must be legislation to secure the permanence of any such system.

Fourth. A revision of the laws in regard to the letting of public contracts and of advertising, so as to prevent a repetition of the matters animadverted upon in the portion of my annual message on the subject of the canals, recently laid before your body.

The committee emphatically opposes the abandonment of the canals, and takes the ground that with adequate improvement they will again become active factors in transportation and promoters of the commercial and industrial interests of New York state.

Cement Macadam Pavements in Germany.

A recent issue of the Centralblatt der Bauverwaltung described the manner of laying cement macadam pavement in Leipsig. A six-inch foundation of sand and gravel or broken stone is laid, and this is covered with a wearing surface of small, hard, broken stone, with which cement has been mixed, a little sand being sometimes added. An idea of the estimation in which the authorities of that city hold this kind of paving can be had when it is known that in 1893 Otto Schulz of Leipsig-Plagwitz obtained permission to lay about 2,400 square yards, and the next year about 9,200 square yards, and several areas of it in 1899.

Ownership of Water Works in New York City.

Governor Roosevelt of New York is quoted as saying "that some bill will be passed which will prevent the city of New York from purchasing the rights of the Ramapo water company, or of any other water company. The principle should be established that the city should construct and own its water works."

Municipal Ownership of London Water Supply Recommended.

The Royal Commission appointed in London, England, in May, 1897, with Lord Llandoff as chairman, has just made its report, in which it advocates municipal ownership of the water works. It recommends the acquirement, by agreement or arbitration, of the works of the eight companies now supplying London, the cost to be met by an issue of 3 per cent. bonds. It is opposed to entrusting the management of the consolidated works to the London county council, but urged that "the water board should be a permanent and not a fluctuating body; consisting of not more than 30 members selected on account of their business capacity, and, if possible, their knowledge of matters connected with water supply; and so constituted as not to give a preponderance to any of the conflicting interests concerned." The commission also proposes that the London county council appoint ten members of the water board, the conservators of the River Thames four, and a member of the county councils and other bodies two each, while their local government board would appoint the chairman and vice-chairman.

A Street Railway Congress.

A street railway congress will be held in Paris in September in connection with the series of congresses arranged by the administration of the Paris Exposition. The congress will be held under the auspices of the International Tramway Union, and will form the biennial meeting of that association. The subjects for the reports and discussions are as follows: (1) Fares on city tramways (or street railways); (2) Results of the application of electric traction in regard to traffic, maintenance expenses and net earnings; (3) Advantages and disadvantages of narrow and standard gauge tracks for electric railways. (4) Central power station plant; (5) Current distribution for long lines by the continuous, alternating and polyphase systems; (6) Cast-welded joints; (7) Storage batteries for electric traction; (8) Heating of the street railways and light railways, as passenger and mixed trains; (9) Advantages of operating secondary railways by the companies owning them or by the trunk lines with which they connect; (10) The adoption of a uniform system for estimating the power of dynamos and motors; (11) Brakes for street railway cars operated by mechanical traction.

Raising a Bridge.

At the February meeting of the Civil Engineers' Society of St. Paul, Mr. C. F. Loweth read a paper on moving horizontally a 361-ft. railroad span with oak wedges. Mr. A. W. Munster described his experience in raising heavy weights with wedges. To cite one case: A steel tower 130 feet high supported deck spans and rested on masonry pedestals, two of which had settled. To plumb the tower thin steel wedges, 42 to a pedestal, were alternately driven and skimmed by eighths of an inch, thus lifting about 300 tons to an inch and a half without damage to bridge, masonry or wedges. The wedges were 18 inches long, 3½ inches wide, rising ⅛-inch in 12 inches and were forged under steam hammer from locomotive springs taken from scrap heap.

Paving Brick Data in Iowa.

The Paving Brick Committee of the Iowa Engineering Society, composed of A. Marston, C. R. Allen, C. S. Magowan, C. P. Chase and William Steyh, as shown by its recent report, has been working in co-operation with the civil engineering departments of the Iowa State College at Ames and the Iowa State University at Iowa City, together with Mr. H. Foster Bain, assistant state geologist. Samples of shale, clay and brick have been collected for analysis and tests at the two institutions named. The samples collected from five different factories number between 5,000 and 6,000.

From each kiln three kinds of brick have been taken, viz., underburned, No. 1, and overburned. These were taken from the points in the kilns at which Professor Beyer made his temperature measurements. These brick are being given the usual standard tests, for loss in the rattler, for crushing, and transverse strength, and for absorption and specific gravity. A very much larger number of specimens is being tested in each case than is customary. In fact in most cases 450 brick of each grade were selected, but on part of these it is proposed to attempt a new test, by a machine designed to imitate closely the chipping effect of horse shoes and the abrasion

of wagon wheels on brick laid as in a pavement. In the rattler parallel tests are being made with brick alone, the N. B. M. A. test, and also with a smaller number of brick but using also a large charge of 8-pound and 1-pound cast-iron brick, which is Talbot's test. As the committee definitely know which bricks are too soft and which are overburned, as well as which are No. 1, it is hoped to do much to settle definitely which is the better of these two tests in detecting defective brick.

In all the rattler tests data are taken for the complete curves of loss for different numbers of revolutions. In part of the tests the curves for individual bricks, even are determined, in order to ascertain the degree of uniformity. In the absorption tests, also, the complete curves of absorption for different times of immersion are determined. Seven hundred and fifty complete transverse tests and about seventy crushing tests have already been made. Besides this about 150 brick have been put through the rattler tests. The work is being pushed rapidly.

The committee says the work outlined during the meeting at Ames to be done directly by the Paving Brick Committee was, first, to prepare standard specifications for paving brick tests; second, to prepare standard specifications for paving brick; third, to collect detailed statistics of all Iowa brick pavements; and fourth, to prepare standard specifications for the construction of brick pavements. This work has not as yet been pushed, because for much of it the results of the tests now under way are absolutely essential, and even in the matter of the collection of statistics it was very desirable that they should be complete for 1900, and not be already a year behind time when the results of the other work of the committee are published. Now, however, the committee is ready to begin active work, and two blanks for the collection of statistics of Iowa pavements have been prepared, containing the following questions:

—Blank No. 1. For general data of the entire brick paving of a city.—

1. Total number of miles, and total number of square yards of brick paving?
2. Total amount of paving of other kinds? What kinds are they, and what was cost of each kind?
3. Kind or kinds of foundations on which brick pavements are laid?
4. Kind or kinds of brick used?
5. Kind or kinds of filler used, and cost of each?
6. Cost per square yard of each of the various kinds of brick pavements used, and what these costs include?
7. Has brick paving in general been satisfactory as compared with other kinds of paving?
8. If any failure in the brick have occurred, to what causes do you attribute them?
9. Character and cost of any repairs which have been required?
10. Do you have trouble from trenches dug to repair pipes and sewers? What, if any, municipal regulations do you have for refilling such trenches? (If possible please attach copy).
11. What have you found to be the relative effects of wheel wear and horse shoe wear on the pavement?
12. Are repressed brick superior to those not repressed in your experience?
13. Which are better in your experience, side-cut or end-cut brick?
14. Which are better in your experience, coal-burned or oil-burned brick?
15. What manufacture of brick have you found to be most satisfactory.
16. Do round edged brick wear better than square edged?
17. What do you consider the most practical foundation for brick pavements?
18. What kind of filler do you prefer?
19. What do you consider the proper thickness of sand cushion?
20. What convexity of cross-section would you recommend?
21. What would you make the relative heights of the center of the street and the top of the curb?
22. How much of the curb would you expose.
23. Would you make the flow line of the gutter at the curb or at some distance from it.
24. Would you point the joints of the curb with cement mortar, and if so with what kind?
25. Are your curbs set on sand or concrete foundations, and which do you prefer?
26. With what material do you "back" the curb?
27. Have you used the combined concrete curb and gutter, and if so with what success?
28. Do you endeavor to have the curbs on the opposite sides of the street at the same elevation?
29. Have you, in order to provide for storm water, had occasion to use open gutters across the street, and if so have they proven satisfactory?
30. Did the severe weather of the winter of 1898-9 have any injurious effect on your pavement in any manner?
31. Were there any unusual rumbling sounds noticed in driving over the pavement during the severe weather?
32. What kind of special paving, if any, next to street railway rails do you recommend?
33. Please add anything further you may wish.

—Blank No. 2. For data of the brick paving on an individual street.—

1. Business or residence street?
2. Traffic heavy or light?
3. Are wide tires used?
4. Single or double street car line or none?
5. What are transverse slopes?

7. Sketch typical cross-section or street, showing crown, curb, parking, etc.
8. Length paved ———? Width paved ———? Number of square yards paved ———?
9. Date paved?
10. Description of foundations, and methods of preparation (including everything below top course or brick)?
11. Depth of sand cushion?
12. Make of brick?
13. Brick side-cut or end-cut?
14. Dimensions of brick?
15. Brick coal-burned or oil-burned?
16. Brick round or square edged?
17. Were brick pressed?
18. Description of filler?
19. Description of curb?
20. Description of special paving, if any, used next to street railway rails?
21. Cost of grading, and what this includes?
22. Cost of paving per square yard (including foundations), and what this includes?
23. Cost of filler per square yard?
24. Extra cost, if any, of special paving next to street railway rails?
25. Cost of curb per linear foot, and what this includes?
26. Character and cost of repairs which have been required?
27. Present condition of pavement?
28. If any failures in pavement have occurred, to what causes do you attribute them?
29. If possible please attach a copy of specifications.
30. Please describe any tests made of the brick and give the results.
31. Please describe inspection during construction.
32. Please add any remarks you may wish.

Commenting on these blanks the committee says: "It will be seen that one of the above blanks is for general statistics of the entire brick paving of a city, while the other is intended for an individual street, and a number would have to be filled out for each of our larger cities. In addition to the general blank it is desired to have these individual street blanks filled out, if possible, for every street in Iowa which has been paved with brick. It is evident that to do this will require a large amount of work, not only on the part of your committee but also on the part of all the city engineers. The very great importance to every one connected with brick paving of the information which could be summarized from these blanks, if completely filled out, fully warrants all this work, however much may be required, but to induce city engineers and other officials to realizez the great importance to themselves and others will require the active co-operation of all the members of this society, as well as of the members of the Paving Brick Committee. It is believed that with proper effort the blanks can be filled out, and that thus we will be able to ascertain with some exactness the result of that test of all tests, behavior under the conditions of actual use.

"The information to be collected on these blanks ought to be of value in assisting in the preparation of standard specifications for the construction of brick pavements. At present there is no uniformity in paving specifications, and what an engineer in one city requires is sometimes the exact opposite to the practice of a neighbor engineer in an adjoining city. Your committee proposes to collect specifications from many different cities, and in the light of their own experience, and of the information obtained on the statistics blanks, to prepare a draft of standard specifications to submit to the society for detailed discussion. As soon as the tests now under way are completed the time seems ripe, also, for the preparation of standard specifications for paving brick tests which shall modify in some respects the N. B. M. A. specifications. Another crying need of the times in connection with paving brick tests is the preparation of standard specifications for paving brick themselves, which shall specify the exact requirements in the case of each of the standard tests. A considerable mass of data is now available for the preparation of such standard requirements, and when the results of the extensive tests now in progress are at hand we will have data as to all Iowa pavers, at least, which ought to settle what should be required in specifications."

Proposed Law Against Water Pollution.

A bill for the prevention of water pollution has been introduced in the house of representatives, at Washington, by George A. Pearre of Maryland. The bill states that "every pollution of every river or other natural source of water supply, whereby the sanitary condition of the people of more than one state or territory or the District of Columbia is affected, is illegal. Every person who shall pollute of materially contribute to the pollution of any such river or other natural source of water supply, whereby the sanitary condition of the people of more than one state or territory or the District of Columbia is affected or threatened to be affected, shall be deemed guilty of a misdemeanor, and, on conviction thereof, shall be punished by a fine not exceeding $5,000 or

by imprisonment not exceeding one year or by both such punishments, in the discretion of the court."

Practical Exemption of Water Companies from Taxation.

A decision has been rendered in the case of the Maine Water company vs. the city of Waterville, Me., in which it is held that a city or town may make a valid contract with a water company wherein, in consideration of the agreement of the company to furnish a supply of water for municipal purposes, it agrees to pay therefor, in addition to a specified sum of money, another sum each year equal to the amount of tax that may be assessed for that year upon the company's property, provided that the consideration for this agreement upon the part of the municipality is reasonably adequate and that the contract in other respect is reasonable and fair.

Although such a contract may be made for the purpose of exempting from taxation the property of the contracting corporation, and the form adopted may be merely intended to cover with the semblance of legality an illegal attempt to exempt property from taxation without a fair return therefor, this is not necessarily so, and the validity of the contract will depend upon the circumstances of each case.

The term "exemption" implies a release from some burden, duty or obligation. It cannot be properly said that a corporation which, for a valuable and adequate consideration, obtains the agreement of the municipality in which it is located to reimburse it for the amount of taxes that it will be obliged to pay, is thereby exempted or released from the burden of paying its just proportion of taxes.

It is considered by the court that the contract involved in this case was fair and reasonable when made; that the city thereby received an amply adequate consideration for its agreement, and has received a fair equivalent for its payments; and that the contract was not intended as the cover of an illegal attempt to exempt the company's property from taxation.

Technical Meetings.

At the February meeting of the New England Water Works association, held at Boston, Feb. 14, a series of papers were presented, illustrated with lantern slides as follows: "The Ozonization of Water," Dr. George A. Soper, engineer and chemist, New York city; "The Construction of the Fells Reservoir for the Metropolitan Water Works," John L. Howard, assistant engineer Metropolitan water works; "Cement-Lined Service Pipe," Fayette F. Forbes, C. E., superintendent Brooklyn water works. Mr. Forbes also introduced a brief discussion on lead poisoning resulting from the use of lead on service pipe.

The twentieth annual meeting of the Indiana Engineering Society was held at the Purdue university at Lafayette, Ind., Feb. 1 to 3. W. K. Eldredge, city engineer of Lafayette, presented a paper on "Local Street Improvements; Methods and Results," in which he described the various stages of street paving development in Lafayette, and showing, among other things, that Portland cement is now being used instead of natural cement for foundations for paving. A paper on "Paving Brick and Brick Pavements," by Prof. D. B. Luten, was illustrated by stereopticon views of pavements, rattlers, diagrams of tests, etc. A. W. Smith, formerly city engineer of Kokomo, Ind., presented a paper on "The Practical Side of Civil Engineering," and this was followed by one on "The Sewerage System of Greenfield, Ind.," by Will J. Cleary, city engineer of that town. The sewers are for house drainage, only, as surplus water is discharged into natural water courses. House laterals are built to the property lines at the time sewers are built. This paper brought out a discussion as to different methods of setting stakes for sewer trenches, and of trenching by machine instead of hand labor. In an address on "The Chemist and the Engineer," W. E. Stone, vice-presilent and professor of chemistry, outlined the important part played by the chemist in regard to analysis and tests of steel, wood, cement, asphalt and other structural materials, as well as of water, sewage, etc. In a paper on "Problems in Practice," J. W. Fawcett, city engineer of Delphi, described some problems in land surveying work. A paper on "A Public Highway Marks the Progress and Degree of Civilization," by J. S. Spiker, of Vincennes, brought out some discussion on the problems involved in getting authority to build roads, and in building and maintaining them. G. E. Waesch, instructor in civil engineering, of the university staff, read a short paper on "The New East River Bridge," which he illustrated by lantern views. A paper on "Standpipe Accidents," by Prof. W. D. Pence, professor of civil engineering, was also illustrated by lantern slides. John Finan, jr., city engineer of Elwood, presented a paper on "The Responsibility of a City Civil Engineer." A paper

by L. S. Alter of Remington, on "Tile Drainage," brought out some discussion, as the subject was of particular interest to engineers in Indiana, where much land has been improved and reclaimed by drainage. In a paper on "Odors and Tastes of Drinking Water," Severance Burrage of the biological department of the university dealt with micro-organisms and not with the influence of the mineral or vegetable matter. Officers were elected as follows: President, J. S. Spiker, city engineer of Vincennes; vice-president, W. D. Pence, professor civil engineering, Purdue university; secretary, W. J. Cleary, city engineer Greenfield; executive committee, W. F. M. Goss, Purdue university. J. B. Nelson, Indianapolis; A. W. Smith, Kokomo. The appointment of committees, the arrangement of program and the selection of the place for the next meeting were placed in the hands of the executive committee.

Engineers' clubs have elected officers for the ensuing year as follows: Columbus Engineers' club, Columbus, O—President, Irvin Butterworth; first vice-president, H. A. Lanman; second vice-president, W. C. McCracken; secretary and librarian, H. M. Gates; treasurer, William Mitchell; directors for two years, W. H. Miller and C. E. Sherman. Canadian society of civil engineers—President, Dr. Henry T. Bovey, dean of the school of applied sciences at McGill university; vice-presidents, G. Herrisk Duggan, P. W. St. George and E. H. Keating; treasurer, J. Irwin; secretary, Prof. C. H. McLeod; librarian, William Roberts.

The Minnesota Surveyors' and Engineers' society held its annual meeting in Minneapolis, Minn., Feb. 20. Some of the papers presented were: "Paints for Highway Bridges," Max Toltz; "Water Levels," W. E. Stoopes; "Farm Drainage," T. A. Hoverstad; "Good Roads," Prof. W. R. Hoag; "County Surveyors' Problems," N. Y. Taylor.

The Engineering Association of the South held its regular meeting Feb. 8 at Nashville, Tenn. W. M. Leftwich, jr., city engineer of Nashville, presented a paper on "The Approaches to the Viaducts on Church and Broad-sts," and Maj. E. C. Lewis gave a comparative study of the "Nicaragua and Panama Canal Routes."

Upholds the Barrett Law.

In a decision rendered by Judge J. V. Kent of the Circuit Court, Lebanon, Ind., Feb. 26, in five cases to foreclose liens for street improvements under the Barrett law, he said the courts should never construe a statute so as to overthrow it if it is possible to avoid it. He is not satisfied beyond a reasonable doubt that the Barrett law is unconstitutional, and it is, therefore, his duty to uphold it, as in principle it had been sustained by many decisions of the supreme and appellate courts; that courts should be slow to overthrow a law that had been upheld for a long time, and under which large investments in money and property had been made. Judge Kent holds also that the legislature should provide the remedy whenever a law is defective.

Meeting of National Brick Manufacturers' Association.

The fourteenth annual meeting of the National Brick Manufacturers' Association, held at Detroit during the first week of February, was one of the most interesting in the history of the organization. The president, Mr. W. D. Richardson, in reviewing business conditions of the last year, spoke of the trust question. He said that the phase of it to be feared most by brickmakers was the trust of the railroads. "Nothing could be feared from this," he said, "if it were the aim by economical management and profitable rates to pay a fair dividend on the actual cost of construction and equipment, but when, through the manner in which railroads have been manipulated, we learn that 200,000 miles of operating railroad in this country owe today enough money to reconstruct the entire system, we begin to understand something of the serious results that may follow from a railroad trust. By the action of the Central Freight Association the rates upon brick were advanced the 1st of January about 25 per cent., a greater increase than upon most other commodities, thus forcing many brickmakers out of their best markets."

The program embraced a large number of valuable papers, and many pertinent questions were submitted for discussion. Among the papers of special interest to those connected with the paving brick industry were "The Construction of Brick Pavements," by Geo. R. Grimes of Terre Haute, Ind., and "The Market Side of the Paving Brick Industry," by F. B. Stevens of Detroit, both of which appear in full in this number of Municipal Engineering.

One of the most important matters brought out in the proceedings was the report of the Committee on Technical Investigation, covering in particular the question of tests of paving brick. This comprises a printed

pamphlet of more than 100 pages, and it is notable that the committee's later investigations have brought it to conclusions different from those which were advanced earlier. The committee gives a summary of the results of its investigations as follows:

While it is by no means intended to give the impression that the preceding investigations are considered to be so complete and final as to preclude the need of elaboration or revision, it is thought that the work done is not only by far the most searching investigation which has as yet been made on this subject, but also that its principal conclusions are established with reasonable security.

Further confirmation is much needed and desired, and it is urged upon paving brick makers to use the experimental facilities of their own plants in the elaboration of such tests as the preceding, on a scale which is impossible in laboratory work. Until the execution of a number of such tests by competent observers has demonstrated the faultiness of this work, the following proposition may be regarded as established:

A.—A clay, being made into paving brick by the stiff-mud process, is more likely to develop its best structure and its greatest resistance to abrasion when by side-cut machinery, ratner than end-cut.

B.—But the peculiarities shown by clays are specific, and not generic, and it is not believed to be possible at present to determine which process should be used in any given case except by actual trial of both processes under the same conditions of test.

C.—Makers of paving brick should assume that their plain wire-cut brick are superior to the repressed brick until they have proven, by careful comparison under identical tests, that the assumption does not hold good in their case.

D.—If repressing is necessary to meet market conditions, the maker should perform the operation so as to cause a radical breaking up of the auger machine structure, and the production of a new and characteristic structure due to repressing. If this is done, the probabilities are that no falling off in quality will occur, and actual gain in strength may frequently result.

E.—The proportions of paving brick are shown to be of greater importance in its resisting power to blows and strains than the actual size. Large size and faulty proportions will produce a brick more likely to fail in use than small size with proper proportions. The most convenient basis for comparison is the ratio:

$$\frac{\text{thickness}}{\text{length} \times \text{breadth}} = \text{"Coefficient of thickness."}$$

This coefficient should have a numerical value of not less than 0.100, and bricks should not be made of such lengths and breadth that, with a thickness of 3½ inches, their coefficient falls below the above value.

The election of officers for the ensuing year resulted as follows: President, W. D. Gates, Chicago; First Vice-President, George H. Clippert, Detroit; Second Vice-President, C. A. Schulz, Kingston; Third Vice-President, Xavier Wittmer, Pittsburg; Secretary, T. A. Randall, Indianapolis; Treasurer, John W. Sibley, Birmingham, Ala.

The arrangements of the local committee in Detroit embraced various features of entertainment, including a banquet at the Hotel Cadillac under the auspices of the National Brick Manufacturers' Association, a theater party and a day devoted to sight seeing in and about Detroit.

Municipal Reports.

Eighth Annual Report of the Department of Public Works for the City of Peoria, Ill., for the year ending Dec. 31, 1899. Joseph Elder, Commissioner of Public Works; A. D. Thompson, City Engineer.

Elsewehere in this number the exceptional value of this report is commented upon editorily. Commissioner Elder dwells chiefly on street cleaning methods. Men, with scrapers, have not given satisfactory service, and a new plan will be tried, embracing the use of pneumatic street sweepers purchased by the city.

City Engineer Thompson, in mentioning the fact that the improvements constructed in 1899, constituted the first work accomplished under the new local improvement laws passed by the Illinois legislature in 1897, says that an investigation of the steps taken in these cases shows that where an improvement follows the regular course in the usual manner, it requires two years from the time of its inception until its completion. The law permits improvements to be paid for in ten annual installments instead of five. The rate of interest on bonds is reduced from 6 to 4 per cent. and it is required that they shall be sold at not less than par. As this is a very low rate of interest for the kind of bonds, Mr. Thompson suggests that such conditions may cause contractors under certain circumstances to increase prices somewhat to cover the possibility of being paid in bonds at par value, which do not sell at par to regular purchasers.

Mr. Thompson states that all of the cedar block pavements and a large portion of the cobblestone and stone block pavements have been replaced with brick and asphalt. The amount of cobblestone has been reduced from 28,116 sq. yds. to 16,670 sq. yds., a reduction of 41 per cent., while the stone block has been cut from 47,378 to 20,729 sq. yds., a reduction of 56 per cent.

The specifications for concrete and pavement foundations were modified in the improvements constructed during the latter part of 1899 to allow the use of clean gravel in the mixing, where formerly broken stone only was permitted. It was hoped that the cost of pavements might be reduced some-

what by this means, but in this there was disappointment as broken stone has since been used entirely for such work.

The specifications during last year for the first time required a binder course in asphalt paving instead of a one-half inch cushion on the concrete foundation. The binder course is one inch in thickness and consists of small particles of crushed limestone bound together with asphaltic cement, thus forming an asphaltic concrete. It adheres firmly to the smooth concrete foundation and bonds with the asphalt wearing surface laid above. The purpose of this construction is to prevent in a measure the cracking of the asphalt in the formation of rolls. Mr. Thompson recommends that the guarantee period on all asphalt streets laid in the future be extended to ten years, if it is possible under the statute to insert such condition in the contract. This, however, is doubtful, as it has been maintained that a guaranty of such length could not be required because it would constitute a maintainance of a pavement by special assessment, which the courts have decided in numerous cases must be done from funds secured by general taxation.

Special investigation of novaculite paving has been made recently by the officials of Peoria, and on this subject Mr. Thompson says:

"About the middle of the season the attention of the authorities was directed to a material for improving streets, known as novaculite. While it has been in use about ten years it was new to this locality, and its merits were thoroughly investigated. It consists of a flinty white rock quarried near Cairo, Illinois, and crushes to any desired size for use in improving streets, much after the manner of macadam. It has been used in St. Louis, Mo., New Orleans, La., Memphis and Jackson, Tenn., Cairo, East St. Louis, Murphreysboro, Sparta, and Quincy, Ill., for various periods ranging from two to ten years and has proved very successful. Pavements of this material laid from four to eight years and subject to heavy traffic without repairs, were examined by his Honor, Mayor Lynch and the Board of Local Improvements with other citizens, and the improvement after such wear was in excellent condition. By cutting through the improvements at various places shortly after a heavy rain the portion below the surface was found perfectly dry, thus indicating the impervious ness of the construction to water. The thickness, after nine years' wear, was not perceptibly reduced, and there appeared to be no tendency—as in the case of macadam—to form ruts or chuck holes under the heavy traffic to which a roadway next to a freight depot is subjected. It is claimed for the material, that it possesses cementing qualities that binds the particles together on the street and prevents the formation of ruts and holes. This may be true of the fine powderly material for the top, but there was very slight indication of such action in the body of the pavement.

"The use of this material for improving streets has been objected to because of the claim that it could not be swept and kept clean. This defect was true in the first construction, but by the proper mixture of fine material on the surface, thoroughly compacted and kneaded by careful construction methods, the difficulty has been apparently overcome and a surface is given of sufficient compactness to prevent picking up in the process of sweeping. The principal advantages of this material over macadam is the non-tendency to form ruts and holes, the absence of dust and mud due to wear and the ability to clean or sweep. It can be laid cheaper than brick or asphalt, costing ordinarily about $1 per square yard, is noiseless, clean, impervious to water and cheap to maintain, and should form a good material for improving side residence streets where the expense of a pavement cannot be afforded. Its claims have not been substantiated sufficiently to warrant its extensive use here until it has been thoroughly tested on a few such streets, nor is it wise to substitute this material for brick or asphalt. It will be given a trial in this city next season, as an ordinance has been passed for paving Dechman-ave. with a five inch limestone base and a five-inch novaculite wearing surface while the property owners on Bradley-ave. have petitioned the board of local improvements for a pavement of novaculite alone."

Mr. Thompson has much to say about damage to pavements from trenches and excavations. No work or expense is spared, he says, to make the foundation and wearing surface of pavements the best that can be secured. The character of the materials and the manner of performing each detail of the work is carefully prescribed by the specifications, which are strictly enforced, but the exercise of such care is a waste of energy when the sub-grade of earth upon which the pavement foundation rests is in a loose and unstable condition. This state of affairs has existed in a greater or less degree on every street paved in Peoria. The streets to be improved are made a close network of trenches in laying or lowering water and gas mains, making repairs to them and renewing the light, water, sewer and gas service pipes. Such work is usually performed but a few days in advance of the paving operations, thus leaving no opportunity for a settlement of the pavement at these places, as the earth cannot be replaced in such a manner that settlement will not occur. This condition has grown worse until now some of the corporations have refused to do the necessary work until the grading on the streets being improved is completed in order to save that much ex-

cavation. An examination of pavements laid for five years or more will show numerous defects due to this cause. The only means of preventing this is to require all of such work to be performed a year before the paving is begun. Where pavements are cut into for the purpose of laying pipes the repairs should invariably be made by the city at the expense of the company, Mr. Thompson thinks. This might cost the interested corporations more, but it would insure good paving to the people and prevent misunderstandings as to the replacing in as good condition as formerly and relieve the companies of responsibility.

Much has been done in the matter of extending good sidewalks in Peoria and Mr. Thompson takes the ground that plank sidewalks should not be allowed in any portion of the city, even as temporary affairs. They are cheap in first cost, but expensive to maintain. They are, besides, a fruitful source of suits for damages in cases of accident

Mr. Thompson urges the importance of official control of private sewer service between the lot and building. The benefits secured by the enforcement of proper regulations at the end of sewer services are frequently more than counterbalanced, he says, by unsanitary practices in the remainder of the line. It is not an unusual practice to connect an untrapped line for open joint tile draining on house, cellar or lot. There is no assurance even that the main service pipe to the sewer is laid with tight joints or in such a manner that it will carry the fluids that enter it. A continuation of improper practices in this line under favorable circumstances may develop conditions that will be a serious menace to public health.

nformation is set forth on the subject of the expenses of the engineering department in thirty-eight cities of the United States, this data having first appeared in Municipal Engineering in January, 1899. In commenting upon this data Mr. Thompson shows that the expenditures in his office for 1899 were only about 63 per cent. of the average expense for similar purposes in other cities.

The municipal testing laboratory was improved during the year by the addition of new machinery. A large quantity of cement was tested, particular attention being given to that used for sidewalk construction. The method employed in former years of making the abrasion test of paving brick was modified considerably. Instead of the round rattler 24-in. in diameter, formerly used with 300 lbs. of scrap iron, a new rattler was purchased having but three sides and being 28 inches in diamater and 3-ft. long. In order to preserve the same proportion of space occupied with cast iron scraps, in this enlarged rattler the amount of cast iron was increased from 300 to 450 lbs., ranging uniformly from ¼ to 4 lbs. in weight. It was also deemed wise to change the number of revolutions per minute form 15 to 30, which makes 1,800 revolutions in an hour instead of 900, and to reduce the maximum weight of the pieces of iron from 5 to 4 pounds. It was necessary to determine the percentage of loss allowable under the new conditions which would be fair to the manufacturers and still preserve the standard of quality adopted by the department. A large number of experiments were conducted for this purpose upon bricks which had given uniform and standard results for several years and the new standard was deducted by comparing the percentage of loss thus obtained with the results secured under the old method. The allowable loss under the new conditions was increased somewhat from what would have been warranted from these results to insure fair treatment.

In the first specifications drawn up the allowable percentage of loss in 1,800 revolutions with 450 pounds scrap iron was placed at 18 per cent. which latter was reduced to 17 per cent., and there has been no trouble in meeting this requirement by the paving bricks of the first class. More thorough investigations will be conducted through the winter and it is probable this percentage will be still further reduced in the spring.

Report of the Proceedings of the Sixth Annual Convention of the American Society of Municipal Improvements held at Toronto, Canada, Oct. 3-5, 1899.

This is a full report of the valauble papers and practical discussions at this important meeting of municipal officials. It makes a volume of over 300 pages, and is of such value that it should be on file in the office of every municipal official in charge of the practical side of public work.

Report of the Proceedings of the Third Annual Convention of the Central States Water Works' Association held at Cincinnati, Sept. 5-7, 1899:

Some of the more important of the valuable papers in this pamphlet have already been published in Municipal Engineering. The report, however, gives the proceedings in full, and among the illustrations are portraits of many of the officers and prominent members.

Street Cleaning by Machinery Advocated by Engineer Rosewater.

In his annual report for 1899 Andrew Rosewater, city engineer of Omaha, Neb., discusses street cleaning as follows:

"Owing to the excessive amount of snow falling during last January and February the cost of removal was far above $2,000. The cleaning of the streets during the remainder of the year was conducted as in the previous year, without sprinkling, and entirely by hand day labor, and cost in the aggregate $17,000. About $1,100 of this was expended for three light one-horse carts employed exclusively in the business center to keep the streets clean of loose papers of every nature.

"The cost of cleaning the city exclusively by hand has been so great that I have endeavored to ascertain by comparison the cost and methods of cleaning in vogue in other cities. For this purpose I addressed letters to the engineers and other officials of every city in the United States having a population of 50,000 and upward.

is done, workmen should be equipped with a hand sprinkler, as is done in New York City, to avoid the annoyance of dust developmtnt."

Regarding civil service, he says:

"After an experience of many years, I deem it proper to again reiterate that in my judgment the only true and economical method of taking care of the streets and alleys of the city is to district the city, adopt a civil service system, and place competent and responsible foremen in charge of maintainance in each case, who are expected to be retained in the service, unless disabled or dismissed for cause. Such foremen should be under the general control and direction of the board of public works, who alone should be held responsible for the proper disbursement of

STATISTICS ON STREET CLEANING IN FORTY AMERICAN CITIES.

Compiled by Andrew Rosewater, M. Am. Soc. C. E., City Engineer of Omaha.

Cities.	Population.	Approximate sq. yds. of paving in city	Paved streets, miles.	Expenditures for street cleaning. Actual, 1898.	Estimated 1899.	Cost of cleaning paved streets. Per mile.	Per 1,000 pop.	Per sq. yd.	Are flushings used?	To work done by contract?	Sprinkling—Do you when sweeping?	Sprinkling—If so, how as work done?	Are distributing pl'c'd on sie?	What is rate of wages is paid for—men and teams?
New York, N. Y.	3,350,000	30,424,960	1,396	$4,758,707	$5,476,068	$3,924.10	$1,542.54	$179.96	Partly	No	Yes.	City.	No.	Men, $722*, team, $6.50.
Chicago, Ill.	1,331,000	.....	1,246	675,000	.....	540.87	499.62	.....	.....	.....	.....	.....	.....	.....
Philadelphia, Pa.	1,250,000	.....	850	545,451	510,722	640.85	.....	.....	Yes.	Yes.	Yes.	Contract.	No.	.....
St. Louis, Mo.	630,000	8,783,420	403	220,856	245,000	598.57	398.98	64.75	Yes.	Yes.	Yes.	Contract.	No.	Men, $1.50; team, $3.75
Baltimore, Md.	600,000	11,750,755	388	360,928	375,288	967.48	625.44	31.93	Yes.	No.	Yes.	City	No	Men $1.00‡; team, 3.25
Boston, Mass.	500,000	8,981,828	479	315,094	320,000	667.40	640.00	35.62	Yes.	No.	Yes.	City	No.	Men, 2.00, team, 4.12
Buffalo, N. Y.	400,000	6,247,401	350	137,376	150,000	434.54	375.00	24.01	Yes.	Yes	Yes	Contract	Yes†	Men, 1.50; team, 4.00
Cleveland, O.	400,000	3,422,222	170	950,000	55,000	323.53	137.50	16.07	Yes.	Yes.	Yes.	Contract.	No	Men, 1.50, team, 3.50
Detroit, Mich.	347,000	4,940,000	268	130,000	144,500	538.14	416.42	29.25	Yes.	No.	Yes.	City	Yes†	Men, 1.50; team, 3.50
Pittsburg, Pa.	300,000	.....	219	137,821	163,469	747.40	543.60	.....	Yes.	No.	Yes.	City.	Yes†	Men, 1.50; team city prop.
Washington, D. C.	287,000	4,623,076	206	177,000	145,000	702.20	504.41	31.36	Both.	Yes	Yes.	Contract.	No.	Men, 1.75, team, $2.50
Milwaukee, Wis.	280,000	1,760,000	75	98,223	103,371	1,378.27	369.18	58.73	Yes.	Yes.	Yes.	Contract	No.	Men, 1.50; team, 3.50
Newark N. J.	250,000	2,155,700	102	37,511	.....	367.59	150.04	17.09	Yes.	Yes.	Yes.	Contract.	No.	Men, 17cts; team, 68cts.
Minneapolis, Minn.	255,000	1,574,640	98	41,893	.....	419.28	165.24	26.47	Yes.	No.	Yes.	City.	Yes†	Men, $1.75; team, $3.00
Jersey City, N. J.	210,000	1,793,333	105	28,000	33,000	330.00	157.14	18.40	Yes.	Yes.	Yes.	Contract.	No.	Men, 1.50; "
Indianapolis, Ind.	200,000	1,786,679	82	52,657	48,500	569.39	232.50	29.52	Yes	Yes	Yes.	Contract.	No	Men, 1.40; team, 3.00
St. Paul, Minn.	175,000	1,000,000	45	30,000	34,000	755.55	194.29	34.00	Yes	No.	Yes	City.	Yes†	Men, 1.75, team, 3.00
Kansas City, Mo.	175,000	1,900,000	170	31,000	35,000	205.88	200.00	11.67	Yes	No.	Yes.	City.	Yes†	Men, 1.75, team, 3.00
Denver, Colo.	165,000	530,000	19	25,000	27,800	1,430.77	168.48	52.45	Yes	No.	Yes.	City.	Yes†	Men, 2.00, team, 3.00
Omaha, Neb.	150,000	1,954,416	69	23,142	18,716*	226.86	124.77	9.57	No	No.	No.	.....	No.	Men, 1.50, team, 3.00
Toledo, O.	150,000	1,800,000	125	9,468	16,000	80.32	66.83	5.28	Yes	Yes.	Yes.	City.	No.	Men, 1.50; team, 3.00
Syracuse, N. Y.	125,000	753,000	36	40,776	72,485	1,905.18	579.88	9 14	Yes.	No.	Yes.	City	No.	Men, 1.50; team, 3.50
Allegheny, Pa.	125,000	1,500,000	68	29,267	35,000	424.24	280.00	23.33	Yes	No.	Yes.	City.	No.	Men, 1.50; .....
Columbus, O.	125,000	2,150,000	110	27,923	64,000	529.87	528.53	29.62	Yes	Yes.	Yes.	Contract.	No	Men, 1.50, team, 3.00
Los Angeles, Cal.	115,000	530,000	19	.....	27,953	1,552.36	243.06	52.74	Yes.	Yes.	Yes.	Contract.	Yes†	Men, 2.00; team, 3.50
Worcester, Mass.	114,000	237,454	11	11,000	11,444	1,022.70	100.39	46.19	Partly.	No.	Yes.	City.	No.	Men, 1.75, teams.*
Paterson, N. J.	110,000	1,028,000	58	.....	.....	.....	.....	.....	Yes.	No.	Yes.	City.	.....	Men, 1.50; team, 4.00
Richmond, Va.	100,000	350,000	22	48,151	56,500	2,568.18	565.00	161.43	Yes.	No.	Yes.	City	No.	Men, 1.50; .....
Albany, N. Y.	100,000	1,419,545	81	41,000	41,000	508.68	410.00	28.88	Yes.	No.	Yes.	City	No	Men, 1.50; team, 2.50
Grand Rapids, Mich.	90,000	.....	39	.....	.....	.....	.....	.....	Yes.	No.	Yes.	City.	Yes.	Men, 1.25; team, 3.25
Lowell, Mass.	80,000	336,000	17	20,284	26,384	1,193.06	329.86	60.58	Yes.	No.	Yes.	City.	No.	Men, 1.75; team, 2.00
Dayton, O.	85,000	740,820	29	31,065	30,000	1,030.22	352.94	42.26	No.	No.	No.	.....	No.	Men, 1.50; team, 3.00
Hartford, Conn.	77,000	200,000	6	.....	.....	.....	.....	.....	Yes.	No.	Yes.	City.	Yes†	.....
St. Joseph, Mo.	75,000	250,000	45	9,000	9,000	200.00	120.00	9.47	Yes	No.	Yes.	City.	No.	Men, 1.50; team, 2.75
Lynn, Mass.	70,000	75,000	3	5,300	6,300	2,016.00	90.00	84.00	Yes.	No.	No.	.....	No.	Men, 2.00; .....
Troy, N. Y.	68,000	805,000	36	.....	.....	.....	.....	.....	No.	No.	Yes.	Contract.	No.	.....
Trenton, N. J.	66,000	261,271	18	9,000	9,000	500.00	136.36	33.87	Yes.	No.	Yes.	City.	Yes†	Men, 1.50; team, 4.00
Charleston, S. C.	65,000	.....	33	12,000	12,000	363.68	184 61	.....	Yes	No	Yes.	City.	No.	Men, 1.25; .....
Evansville, Ind.	65,000	656,533	95	75,000	95,000	2,800 00	1,461 54	137.97	Yes	Yes.	Yes.	Contract.	No.	.....
Salt Lake City, Utah.	60,000	107,771	3	3,000	5,440	2,014 81	90.67	59.47	Yes	No.	Yes.	City	No.	Men, 1.75; team, 3.00

*Includes $2,000 for removal of snow and ice. †Assuming that all paved streets in each city are cleaned. ‡Per annum. §Also for horsecart, $2.50. ‖To the question: "Is the practice satisfaetory?" these places replied, "Yes;" others made no reply. ¶Single team, $3.00; double, $4.00.

‡Cleveland reported that 9 hours constituted a day's work; 8 hours was reported for Buffalo, Detroit, Pittsburg, Omaha, Allegheny, Los Angeles, Albany, and St. Joseph; the other places did not report.

"Dividing the total cost by the total of paved streets in Omaha, for comparison, the cost per mile of cleaning in Omaha is $9.57 per mile, yet, as a matter of fact, the cost per mile of streets actually cleaned amounts to nearly $35 per mile. With the use of proper sweeping machinery and sprinklers this cost could be reduced with better results to one-third that amount. The charter prohibits the cleaning of streets by contract, but it does not prohibit the city from purchasing or leasing machinery and employing men by day labor to handle the machines and the work.

"With the proper appliances as much labor could be employed with the same expenditure, and made to cover three times the mileage now cleaned. In order to do this economically and without creating a nuisance, sweeping machines should be preceded with sprinklers before proceeding upon any streets, and with such sections of the city where hand sweeping

the money apportioned for public work. All permanent employes should be properly uniformed, as is done elsewhere, and to be required to attend strictly to business during working hours. Under existing methods of perpetual rotation in employes the best service cannot be expected nor realized. The temptation to conserve personal and partisian interests is too great to be resisted by whatever party may be in power, and until such a system is adopted, public work cannot be prosecuted to the best advantage."

Complicated Liability for Injuries from an Open Trench.

The New York Supreme court rendered a decision Feb. 6, in the suit of the Buffalo Natural Gas company, Buffalo, N. Y., against the Barbar Asphalt Paving company. The suit was a peculiar one and was

the result of a man riding into an open trench and sustaining serious injuries. He brought a claim against the city and secured a verdict of $300. The city then sued the Natural Gas company, which caused the trench to be dug. The gas company settled with the city, and as the company had a contract with the Barbar Asphalt Paving company to repave the portion of the street which had been torn up, looked to it for reimbursement, claiming the company had not done its work in time. The Barber Asphalt Paving company refused to pay and the gas company brought suit, receiving a verdict for $418.69.

The Use of Refuse as Fuel.

The following interesting letter from Mr. George Westinghouse, president of the Westinghouse electric and manufacturing company, recently appeared in the New York Times:

The bringing together of the gas and electric light and power interests in New York should result in great advantages to the public and to the interests so combined, provided the latest developements in gas and electric engineering are investigated and availed of. Among the numerous questions affecting the health, comfort and convenience of the citizens of New York (and of all communities, in fact) are three of especial importance, viz.:

The disposal of garbage, the abatement of the smoke nuisance due to the increasing use of bituminous coal for steam power purposes, and the securing of an adequate supply of water.

From statistics there appear to be created daily in New York about 500 tons of garbage, or at the rate of one-half pound per capita. Such garbage is about 20 per cent. carbon and 80 per cent. water. By a process which has been well demonstrated on a small scale, and which is being rapidly brought to a commercial basis, all of this garbage can be economically, and without offensive odor, converted into a fuel gas of great value. In the same apparatus and by the same process soft coal can be made into a gas suitable for power and heating purposes.

The fuel gas made from garbage and soft coal can be used to drive gas engines with electric generators, and the electricity thus produced can be used for light and to drive motors to the exclusion of the thousands of steam engines and boilers which make such demands upon the water supply, since the gas engine central stations can be so located that the water needed for engine-cooling purposes can be taken from the river.

Bearing upon these questions, and of especial importance, are the partially executed plans of the electric power and light corporations, viz: the Metropolitan, Third Avenue and Manhattan Elevated railways, and the New York Gas and Electric Light, Heat and Power company and the United Electric Light and Power company. If their present plans, which are fairly well-known to the engineering profession, are carried to completion, each will have one large steam station on the East river between Twenty-ninth-st. and the Harlem river, with about 75,000 horse-power of engines, boilers and electric machinery, making an aggregate of 375,000 horse-power, and which may be largely increased when the underground rapid transit railway is completed, and still further when the electric locomotive is used on all steam railways within the city limits.

If these corporations, which might as well buy electricity as the machinery, coal and water with which to produce it, were to unite in a common plan to provide the electricity needed in their operations by the adoption of the best available methods, the saving to each in capital expenditure would be very great, and the decreased cost of their supply of electricity would make an important addition to their earnings applicable to the payment of dividends; while, most important of all the citizens of New York would have solved for them the garbage, smoke, and very largely the water question.

I believe the contemplated plans of the corporations above named, which can be shown to be based upon an imperfect knowledge of the subject, will stand in the way of vast public interests, and, so believing, I have said to representatives of some of those companies that the near future would demonstrate the projected power stations and systems of electrical distribution incidental to the character of such stations, to be as far from the best as are the old cable systems for the propulsion of cars.

I write this letter because I believe these subjects are just now worthy of investigation, discussion, and elaboration.

Dr. Carey T. Hutchinson of New York City, the well-known electrical engineer, replied to Mr. Westinghouse as follows:

"The letter from Mr. George Westinghouse calling attention to the great advantages that would accrue to the citizens of New York from the use of garbage as fuel, and to what he considers to be the 'imperfect knowledge of the subject' shown in the engineering plans for the large power stations, about to be erected on the East river, deserves some comment.

"Mr. Westinghouse estimates the amount of garbage available daily in New York City at about 500 tons. He implies that this amount of garbage converted into gas and used in gas engines would be sufficient to supply a material part of the output of the great power plants that he refers to. Experiments made in England based on the burning in steam boilers of 26,000 tons of ordinary city refuse show that one pound of such refuse will make one pound of steam. On this basis, assuming the best engines and electric generators, twenty-five pounds of refuse would be required for each unit (kilowatt-hour) output of electric energy from the power plant.

"Mr. Westinghouse, however, does not propose to use the refuse for making steam, but purposes converting it into a fuel gas. He gives no data as to the value of the refuse used in this way, beyond the statement that 'all the garbage can be converted into a fuel gas of great value.' It is simple, however, to give an approximate idea of the possible limit to the efficiency of a process of this kind.

"Assuming the analysis of the garbage given—that is, 20 per cent. carbon to 80 per cent. water—the maximum theoretical heating value of one pound of refuse is very approximately 2,000 thermal units; if all this energy can be recovered in the form of a gas—that is to say, if the efficiency of the energy conversion from refuse to gas is perfect, and assuming a ratio of 20 per cent. between the energy in the form of electricity and the theoretical energy of the gas—a high figure—it would require 8.5 pounds of refuse per unit (kilowatt-hour) of electric energy. This figure fixes the maximum theoretical duty of a pound of such refuse when converted into a gas and used in a gas engine. It is not probable that the actual commerical duty of the process will equal fifteen pounds of refuse per kilowatt-hour.

"That is, a consideration of the elementary principles involved, shows a probable duty of fifteen pounds of refuse per unit (kilowatt-hour) in comparison with twenty-five pounds, deducted from extensive tests on steam. This difference represents the possible improvement due to the use of gas engines.

"Assuming then that a unit of electric energy can be obtained from fifteen pounds of refuse, the 500 tons would yield about 67,000 units. As Mr. Westinghouse truly says, the aggregate power of the large steam plants mentioned is approximately 375,000 horse-power. The daily output of these plants will be approximately 2,500,000 units; in other words, the maximum result that could be got from the consumption of all the garbage of New York City in the way that Mr. Westinghouse describes, would supply about two and one-half per cent. of the daily output of power from these stations alone. This is so trifling that it is hardly worth consideration, not being even sufficient to drive the pumps and auxiliary apparatus in the various power houses.

"Looked at from another point of view, the daily demand for power from these stations will call for the consumption of nearly 3,500 tons of the best coal. Mr. Westinghouse proposes to use 500 tons of refuse to do the work of 3,500 tons of good coal."

Personal Notes.

William F. Keene has been elected city engineer at Central Falls, R. I.

Benjamin T. Kendall has been appointed city engineer at Baltimore, Md.

Perry F. Brown has resigned his position as city engineer at Janesville, Wis.

George C. Earl has been elected sewerage and water engineer at New Orleans, La.

Merle C. Cowles has been appointed superintendent of streets at Bridgeport, Conn.

John M. Seabury has been appointed superintendent of streets at Binghamton, N. Y.

Alfred L. Maggi has been elected city engineer and John H. Crandon water commissioner at Chelsea, Mass.

Ernest W. Baley has been appointed city engineer and Frank E. Merrill water commissioner at Somerville, Mass.

Van Norman McGee has been appointed to the chair of civil engineering at the Chinese imperial university at Tien Tsin.

Col. Park Woodward has been re-elected superintendent and J. R. Dimmock secretary of the water department at Atlanta, Ga.

Carlton E. Davis, Madison, Wis., has been appointed resident engineer for the construction of a storage heservoir at Cedar Grove, N. J.

William H. Barclay has been selected commissioner of public works and George A. Carpenter re-elected city engineer at Pawtucket, R. I.

Charles H. Ott has been appointed to temporarily succeed Capt. C. K. Morehead, resigned, assistant engineer in the bureau of surveys, Philadelphia, Pa.

Percival E. Nagle was appointed street cleaning commissioner of New York city, Feb. 10, by Mayor Van Wyck, to succeed the late James McCartny.

F. L. Olmstead, jr., has been appointed head of the new department of landscape architecture of the Lawrence scientific school, with A. A. Shurtleff for assistant.

Maj.-Gen. Francis V. Greene, U. S. V., has resigned his place as president of the Barber Asphalt Paving company of New York City. Gen. Avery D. Andrews succeeds him.

Bertram Brewer has been elected city engineer and superintendent of sewers, and Laroy Brown superintendent of water works and water register at Waltham, Mass.

Maj.-Gen. William W. Averill died Feb. 3 at his home in Bath, N. Y. Gen. Averill was a cavalry leader in the civil war, and after the war he became president of the Barber Asphalt Paving company.

James McCartney, superintendent of street cleaning, New York City, died Feb. 7. He was appointed Jan. 1, 1898, to succeed Col. Waring, and it is claimed that he kept the department as nearly like the Waring standard as is possible under the Tammany control of city offices.

Lieut.-Col. Charles J. Allen, Maj. T. W. Symms and Capt. D. D. Gaillard of the Corps of Engineers, United States, and Stanford White and James G. Hill have been appointed judges of the competitive plans for a memorial bridge at Washington. The plans were submitted by George H. Morison, William H. Burr, William R. Hutton and L. L. Buck.

Alfred M. Quick, Assoc. M. Am. Soc. C. E., of the firm of Hill & Quick, has been appointed chief engineer of the Baltimore water department and president of the water board, at Baltimore, Md. Under the new charter he will also be a member of the boards of estimate and of public improvements.

C. P. Collins of Johnstown and C. G. Tate of Altoona, Pa., have entered into partnership to practice general civil engineering in the city of Johnstown. Mr. Collins came to Johnstown in Aug., 1890, after having spent about three years in general municipal work in Boston and Providence. At that date he entered the service of the Cambria Iron company, and until the first of the present month had charge of their civil engineering work. Mr. Tate is a graduate of Purdue University, and until recently was also connected with the same company.

SELECTIONS FROM THE PRESS.

Municipal Manufacturing Does Not Pay.

Pittsburg, which is about to undertake the building of hose and patrol wagons and of other vehicles used by the city departments, is warned by the Boston Transcript that the venture will not pay. The warning is based on the experience of Boston along similar lines. The latter city has maintained for many years, in connection with its fire department, a repair shop equipped in the best manner and employing the best machinists, wheelwrights, blacksmiths, painters, etc., that the market has afforded. It could build hose wagons and ladder trucks, but it would not pay. Apparatus harness used to be made there, but it can now be bought more cheaply outside. The deparment formerly made its own mattresses, but it is now more economical to purchase them. In short, the shop has stopped manufacturing along all its former lines, and now devotes itself almost wholly to repairing. As a matter of dollars and cents, even this could be done at a less cost by private shops, but the element of necessity comes in at this point, for fire apparatus must be done when it is needed, and repairs may be required at any time of day or night, Sundays or holidays, so there must be a force directly under department control. Other Boston experiences in the line of municipal ownership have not been to the advantage of the taxpayers. The municipal printing plant is self-supporting, to be sure, and ought to be, as it makes its own rates and controls its own bookkeeping, but the departments are paying more for their printing. More is paid, too, for general repairs, since the city established an institution of that character, than when each department looked after its own interests, making the best terms it could.—New York Evening Post.

New Electric Light Carbons.

It is stated that a proposition will be made to this city to furnish it free of charge with a certain amount of a new kind of electric light carbons, so that tests may be made and the advantage of using them, if any there be, may be ascertained. The carbons are the invention of Frederick Hackman of St. Paul, formerly of this city. It consists of a carbon tubing filled with calcium carbide powder. The effect, it is said, is the production of a light of at least eight times the brilliancy of the ordinary carbon. Mr. Hackman has tried to introduce this carbon in St. Paul, and the board of public works of that city has favored his idea to the extent that in advertising for bids for electric lighting it has specified his carbide carbon. The council also adopted the views of the board of public works in this respect. The proposition was that the company which furnishes the electric lighting for the city of St. Paul should furnish the current, meters should be supplied to determine the amount of current used, and that the company should be paid in proportion to this amount. The claim was made that the calcium carbide carbon light required a considerably smaller amount of current, as demonstrated by tests, and that a great saving would be made by the use of the new carbons. But the electric company, it is stated, claimed that by using the new carbon and having the current measured by meters it would be unable to run its plant at a profit, because the amount of current to be furnished by it would be smaller on account of the saving of the current.—Electrical World and Engineer.

Street Fountains.

To break up the monotonous angularity of streets I suggest that a fountain be placed at street intersections, around its base a bank of flowers, then a broad walk and trees around the circle and seats under the trees. I would repeat this place of rest so often that one would not be out of sight or hearing of the fountains at any point on the street. Between the fountains, if necessary to give variety and add interest to the street, I would place monuments, statues or other decorative works, and surround them with shrubbery and flowers. A scheme of this kind offers a chance for a variety of treatment and is feasible in the most densely populated districts of a city. Think of a fountain with trees and flowers and comfortable seats in tenement districts, opening up to these neglected parts of the city places where the bright sunshine might penetrate and flowers and shade and running water cheer the inhabitants.

Every city has acknowledged the necessity of doing something to improve the tenement district by tearing down blocks and turning those places into parks. But it is very expensive. For this reason breathing places and gardens—beautiful and comfortable places for the poverty-stricken, hard-working and weary inhabitants of overcrowded tenements—are largely unavailable by those who most need their benefits. At the cost of one of these parks—which wipes out of existence scores of dwelling and business buildings, and with them all the revenues to city and individuals—and without interfering

with business or the sacrifice of a tenement, whole tenement districts could be made to blossom as the rose in spots if not within sight of each other, at least within easy walking distance from one to the other. It is good business as well as good health and good morals to make the lives of the working masses as comfortable as possible. And it is also good politics; for rest and revolution are born of the unbearable miseries and neglect of the laboring masses, whose only argument for redress of grievances is force.—From "Municipal Aesthetics," in Municipal Affairs, suggested by George E. Bissell.

Open Spaces in Cities.

Although the advisability of having numerous parks and open spaces within city limits is now generally conceded in theory, their great artistic value is not as yet fully recognized, especially by those who have charge of our municipal finances. A hundred years ago even large cities were much smaller than they are now, the houses were lower, there was less smoke, and it was comparatively easy to get out of town to enjoy the fields and forests. With the rush and pressure of our modern living a reaction has come in the shape of a positive craving for the rest and beauty which can only be satisfied through contact with nature. This is felt by all classes alike, but while the rich man can easily escape from the tyranny of bricks and mortar, noise and dust, the vast majority of a city's population must endure them as best they may. The feeling of responsibility of the richer classes for their poorer neighbors, even if these are no longer personal chattels, has grown up entirely within the last one hundred years, and the community has realized the duty of providing air and space for those who are not free to seek them at a distance from their homes. The cost has been considerable, but it has been more than offset by the decrease in the death rate and the enjoyment which has come to thousands.—From "City Parks," by Beatrix Jones, in Municipal Affairs.

MACHINERY AND TRADE.

Galesburg Paving Brick Industries.

The city of Galesburg has become noted as the location of the most extensive plants for manufacturing paving brick in the United States. The reputation of this product has also steadily advanced until "as good as Galesburg brick" has become an expression indicating the highest standard of quality. Four separate brick factories are located at this point, known as the Galesburg Paving Brick company, the Galesburg Brick and Terra Cotta company, the Galesburg Vitrified Brick company and the Purington Paving Brick company, the combined capacities of which are 78,000,000 bricks per year, an amount sufficient to pave approximately eighty miles of thirty-foot roadway, or about two-thirds of the total brick pavements laid in the United States in any one year.

The bricks are manufactured from a pure shale and each plant is equipped with the best and most modern machinery, while the most improved methods are applied in their operation.

The largest plant is the Purington Paving Brick company, with an annual capacity of 60,000,000 bricks. It is not the intention to enter into a detailed description of this plant, but a number of changes and improvements noted during the visit of a representative of this magazine are of sufficient importance to receive attention. Such changes indicate a wideawake policy and an ambition to improve the quality of the output by every means possible. Very few people realize the amount of money annually spent by manufacturers of paving brick in the conduct of experiments to improve the quality of the product and decrease the expense of manufacture.

The magnitude o the Purington plant can be better appreciated after a statement of the following points:

This company operates two plants covering seventy-five acres of ground, employing 300 men. Each plant is fitted with two auger chambers, machines whose combined capacity is 60,000,000 bricks per year. There are two large steam shovels for digging the shale, four dryers eighty-four feet long, three of which have sixteen tracks and one twenty tracks for drying the green bricks, and twenty-seven down-draft, square kilns, fifteen of the Eudaly type and twelve of the Graves. All the paving bricks are repressed on fourteen Eagle presses.

There are now 16,000,000 bricks on hand to begin the spring shipments. During the last year 1,200 cars of freight were shipped in and out. Thirty-eight million paving bricks were sent out to the various

points, the greatest shipments being for paving about three miles at St. Paul, Minn., three miles at Lincoln, Neb.; one mile at Minneapolis, Minn.; one mile at Peoria, Ill., and ten miles at Chicago, Ill.

Many improvements and modifiations have been put in operation for the future manufacture. A contract has been let for constructing flues, etc., for utilizing the waste heat from the kilns for drying purposes which will replace the present method of drying by coal. The regular paving brick manufactured by this firm has been

providing a space for the flange of the car wheel. These blocks have been used four years on the floor of a large bridge at Minneapolis and they have also given satisfactory service on the streets of St. Paul, Minneapolis and Waukesha.

Test of the Buckland Street Rail Paving Block.

Seth J. Buckland reports that a company is being organized for the purpose of manufacturing and selling his device for converting tramhead girder rails into full

MAKING FULL GROOVE RAILS OUT OF TRAM-HEAD PARTS WITH THE BUCKLAND DEVICE

2½x4x8 inches but one machine will be fitted to manufacture a block 3x4x8 inches, which will have raised letters on the side ⅛ inch high spelling "Galesburg Blocks."

This improvement will not be limited to the blocks as the bricks now being made have two small projections on each side of the above height to separate them when laid to allow space for a filler.

"T" rails on paved streets have caused an endless amount of trouble and expense but the Purington company is manufacturing a special block shaped to fit closely to the head and web of such rails and also

groove rails. The experiments with it in Springfield, Mass., have been very satisfactory, according to the reports of those who had charge of the tests. In his annual report for 1899 City Engineer Slocum says "the device has now withstood the action of the traffic for more than a year, and shows no defects whatever, and is evidently in every way a most satisfactory device, affording the public all the advantages of a street having a full grooved rail. It can be used at a great money saving over and above what would be required to take up the pavement and substitute a new

full-grooved rail. The Board of Supervisors and the local street railway authorities had practically determined to tear up the street and replace the tramhead rail with the full grooved rail. In consideration of the large money expenditure to be involved, and the considerable saving that would result from the use of the 'Buckland device,' the department was led to make some experimenting to further determine its strength and sufficiency. These experiments were entirely satisfactory and were in character more severe than could be brought about by conditions of street traffic. In consequence, the board were led to urge upon the company the adoption of the device, which was finally agreed upon, and the City Engineer instructed to prepare specifications for contracting the work and the supervision of the construction. The work was carried out successfully, although performed late in the season, and is of great satisfaction to the public who travel the street."

The accompanying illustration shows the workmen engaged in adjusting the device to the street rails on Dwight-st., in Springfield.

Recent Inventions.

(Reported especially for MUNICIPAL ENGINEERING by Arthur M. Hood, Indianapolis, Ind. Copies of any patent may be obtained for ten cents.

641,804. Jan. 23, 1900. Apparatus for removing snow. Reuben Shirreffs, Richmond, Va. A wheeled vehicle having scrapers attached to guide the snow into the interior, where it comes into contact with compressing means by which the snow is compressed into cakes of sufficient solidity to be easily handled.

642,203. Jan. 30, 1900. Combined transit and gravity level. F C. Brown. Loveland, Col., assignor to J. Beal and O. J. Smith, Berthod, Col. The telescope is supported upon the upper end of the weigthed pendulem, the lower end of which may be engaged at any point by a spring pressed catch.

642,314. Jan. 30, 1900. System for liquidizing snow and disposing of the same. Thomas Finigan, Patterson, N. J., assigner of two-thirds to John Hinchliffe and E. D. Cundell same place. A catch basin for which a sewer connection is provided and in the bottom of the basin is mounted an adjusting device by means of which snow dumped into the basin may be disintegrated and driven in its disintegrated form into the sewer.

642,530. Jan. 30, 1900. Catch basin. G. A. Robertson, Westmount, Canada. The basin is composed of a series of tapered sections resting one upon the other with large ends down, the outer periphery of said sections being entirely free from projections so that the surrounding earth can exert no displacing or uplifting pressure upon any one of the sections.

642,937. Feb. 6, 1900. Street cleaning device. G. M. Ward, Newark, N. J. Assignor one-half (½) to G. W. Reeve, jr., same place. A sweeping machine having a forward rotating brush which delivers the dirt to an inclined endless carrier, which in turn delivers into a detachable sack.

642,978. Feb. 6, 1900. Process of testing cement. S. G. Haase, Oak Park, Ill. Assigner to E. & T. Fairbanks & Co. St. Johnsbury, Vt. The process consists in first forming the specimens into ring briquets of a uniform standard, section, size and opening and then subjecting the same successively to accurately-measured frushing force in the direction of the diameters of the specimens.

642,979. Feb. 6, 1900. Briquet, S. G. Haase, Oak Park, Ill. Assignor to E. & T. Fairbanks & Co. St. Johnsbury, Vt. The briquet is a ring having a definite unit of size in both width and thickness.

643,407. Feb. 13, 1900. Bridge gate, Paul Gfroerer, Evanston, Ill. Assignor one-half (½) to N. P. Hoffman, same place. A pair of vertically swinging gates operated by pinions set in motion by a segmental rack carried by the end of a horizontally swinging bridge draw.

643,488. Feb. 13, 1900. Dam, retaining wall, breakwater, etc. J. S. Fielding, Pittsburg, Pa. This consists in building longitudinal and transverse vertical walls and a top or cover uniting said walls

640,118. Dec. 26, 1899. Combined sprinkler and dirt wagon. J. J. Eck, New York, N. Y. A two-wheel hand truck upon which is detachably mounted a dirt can and water reservoir provided with sprinkling nozzles.

640,464. Jan. 2, 1900. Street pavement softener. W. J. Gillett and E. B. Doen, Syracuse, N. Y. A two-wheel hand truck carrying two sets of carbon terminals. The points of the terminals may be brought near each other close to the pavement, so that an electric arc may be formed therebetween, and close to the pavement.

640,477. Jan. 2, 1900. Street sweeper. James Maxon, Burbank, Cala., assignor to Azusa Mfg. Co., Los Angeles county.

640,820. Jan. 9, 1900. Underground conduit. C. H. Sewall, Chicago, Ill. A continuous underground conduit formed of concrete.

641,197. Jan. 9, 1900. Filter for purifying sewerage. W. M. Ducat, London, England. An aerobic bacterial filter having a series of air supply pipes connecting the effluent collecting floor with the exterior atmosphere in such manner as to cause the air supply to be heated by the heat from the effluent.

641,594. Jan. 16, 1900. Garbage cart. Alexander Hartwich, Vienna, Austria-Hungary. More properly a street sweeper's hand cart having a detachable receptacle and a sprinkling reservoir.

Trade Notes.

BRICK.

The location of a brick and tile plant at Waterloo, Ia., is contemplated by F. E. Swift of Washington, Ia.

The Alton Paving, Building and Fire Brick company, Alton, Ill., held its annual meeting recently and re-elected officers.

The Washington Brick and Lime company, Spokane, Wash., will establish another brick and sewer pipe plant this spring at Clayton, Wash.

P. Doherty, water work and drainage contractor, 608 W. Ninth-st., St. Paul, Minn., desires to correspond with manufacturers of vitrified paving brick.

The Copeland Brick company, Birmingham, Ala., has been incorporated by J. R. Copeland, J. L. Lunsford and A. Latady for the manufacture of brick and tile.

The Old Colony Sand and Brick company, Kittiery, Me., has been organized for the purpose of constructing roads, bridges, dams, etc. Ernest Nickerson, Boston, pres't.

CEMENT.

The Pembina Portland Cement company, Milton, N. D., is preparing to work night and day.

The Helderberg Cement company, Howe Cave, N. Y., is building an addition to its plant and adding new kilns.

S. A. Walker, W. J. Kelly and Ernest Dale Owen, St. Louis, Mo., have incorporated the Metal Core Cement company.

Portsmouth, N. H.—Bids are asked until March 23 for furnishing Portland cement and sand. Maj. W. L. Fisk, U. S. Engr.

The American Cement company, Philadelphia, contemplates building plants in Nansemond and Isle of Wight counties, Virginia.

The Milwaukee Brick and Cement company has completed one of a series of new cement mills at its works at Whitefish Bay, Wis.

Ft. Monroe, Va.—Bids are asked until March 17 for furnishing cement, broken stone, etc. Maj. James B. Quinn, U. S. Engr., 166 Granby-st., Norfolk.

Washington, D. C.—Bids are asked until March 3 for furnishing cement, fire brick, fire clay, etc., at the Naval station, Puget Sound, Wash. A. S. Kennedy, Paymaster-General, U. S. N., Washington, D. C.

According to press reports three Portland cement plants will be erected by a Detroit company, one at Fenton, Mich., one at Holly, Mich., and one between Holly and Fenton.

The Northern Hydraulic Cement and Stone company, Minneapolis, Minn., has been incorporated by Fred Sheridan, L. P. Van Norman, George Williams and H. H. Coleman.

The Caledonia Cement company, Caledonia, N. Y., has been incorporated and will build a plant at once. A. W. Burwell, Cleveland, O., is interested in the new enterprise.

The Arkansas Portland Cement company, Texarkana, Ark., has been incorporated with T. A. Whitmore as president, Samuel Lazarus, vice-president, and E. K. Smith, secretary and treasurer.

The Imperial Portland Cement, Lime and Stone company, Sandusky, O., has been incorporated by C. Z. Wagner, A. E. Merrill and R. E. Schuck of Sandusky and G. A. Stanley of Cleveland.

The Shallow Lake Portland Cement company of Ontario, Ltd., has been incorporated by J. E. Murphy, R. P. Butchart, G. S. Kilbourne, John Lucas, J. M. Kilbourne and D. M. Butchart of Owen Sound, Ont., Canada.

The German-American Portland Cement works have opened offices at 1510-11 Marquette building, Chicago. The officers of the company are: President, Carl Prussing; vice-president, C. Kellermann; secretary, Fritz Warm. A new plant is being built near La Salle, Ill.

The Goshen Cement company has purchased more marl beds in Osolo township, near Goshen, Ind., and Osborn & Co. of Cleveland, O., are making final tests of the deposit, with regard to its quality and composition, preparatory to furnishing a prospectus of the beds. The owners of the property are C. W. Miller, J. W. Replogle, D. W. Neidig, G. E. Rieman, A. J. Irwin and Milo Meredith.

W. J. Johnson, Ft. Smith, Ark., has been appointed receiver for the White Cliffs Portland Cement and Chalk company, White Cliffs, Ark. The company was recently reorganized, after which a lease of the property was made to the Arkansas Cement company for a rental of $20,000 a year, which petitioners allege to be less than the interest on the money invested.

The Peach Bottom Cement, Tile and Brick company, Delta, Pa., has been incorporated to make cement of the refuse slate of fifty years' accumulation. The main officers will be in Baltimore, Md.

More than 1,000 acres of marl lands have been discovered at Decatur, Mich. The Decatur Republican will answer inquiries concerning the location and resources of the lands.

The Central Cement company is the name under which the five natural cement mills located in Silver Creek township, Clark county, Indiana, have been incorporated. The mills included in the combine are the Kentucky and Indiana, the Globe, the New Albany, the Banner and the Clark county. The product will be sold by the general manager. It is not proposed to antagonize the other mills, but simply to handle the output through a joint selling agency, which will, it is believed, prove more economical.

E. J. Robinson, Indianapolis, Ind., has organized a company of New York and Chicago capitalists and will begin at once the manufacture of Portland cement from

oolitic limestone, at Bedford, Ind. The new plant will cost $200,000. Exhaustive tests have been made by Prof. Bravender, of Warners, N. Y., of the relative values of oolitic limestone and marl for producing cement. These tests showed that marl contained 93 per cent. of carbonate of lime, which is the active principle of cement, whereas the oolitic stone contained 98.18 per cent. Prof. Bravender made fifty-four tests, nineteen of which were on samples of marl taken from the extensive beds at South Bend. The discovery is important, as it opens up an entirely new field of industry in the limestone deposits of Indiana.

The Peerless Portland Cement company, Union City, Mich., has reconstructed its plant, materially increasing its capacity. A three-story 80x100-ft. warehouse has been erected, and a 44x66-ft. machine shop added. The boiler-room, 48x60 ft., contains four tubular and one water tube boiler, all fitted with mechanical stokers, and rated at about 1,000 H. P. The engine-room contains one piston-valve engine driving a 400-light dynamo, and two Corliss engines. The mixing-room, for preparing the slurry, is 100x50 ft. and is fitted with an annex to accommodate a Cummer dryer for use in evaporating part of the moisture from the slurry. The modified Dietzsch kilns, 19 in number, have been entirely reconstructed and the company expects to be able to produce 1,000 to 1,200 barrels of cement daily.

BRIDGES.

The Brackett Bridge company, Cincinnati, O., has filed articles of incorporation in Illinois.

The Illinois Bridge and Machine company, Jacksonville, Ill., was incorporated Feb. 7 by Charles A. Slaughter, Samuel Eastman and Charles Rabjohn.

Capitalists of Waukesha, Wis., have subscribed $65,000 for the erection of works for the manufacture of iron bridges and structural iron work. The plant will be built early this spring.

The Easter Bridge and Structural company, Worcester, Mass., has been incorporated to manufacture, buy and sell bridge and structural materials. A. H. Inman and A. S. Huller, jr., are among the incorporators.

The location of big bridge iron and steel works in Milwaukee, Wis., is contemplated. The stockholders of the proposed company are Samuel Breese, J. L. Brickels, George Harding, W. P. Sawyer, T. E. Ryan, R. P. Breese, G. H. Wilbur, E. L. Bullard and James K. Lowry.

The Lindmore Bridge company, Pittsburg, Pa., has been incorporated to construct a bridge over Butcher's run from Dunlap-st., Alleghany, to a point on the opposite shore. The directors of the company are F. J. Torrance, A. C. Latimer and P. M. Katlmer.

The Grand Rapids Bridge company, Grand Rapids, Mich., has been incorporated to conduct a general contracting business and erect and repair bridges. The company will operate throughout the United States. M. J. Reisinger, F. L. Gaines and J. M. Vandenberg are stockholders

ELECTRIC LIGHT COMPANIES.

The largest electiric plant of the Bellaire Steel works, Bellaire, O., was totally destroyed by fire Jan. 30, entailing a loss of $100,000.

Application for a receiver for the Niles Electric company, Warren, O., has been made by Elmer Wilson, secretary.

The works of the Electric Improvement company, San Jose, Cal., were destroyed by fire Jan. 27, entailing a loss of about $100,000.

The San Pedro Terminal Gas, Electric and Power company, Los Angeles, Cal., has been incorporated to deal in electricity, gas, etc. The incorporators are: F. H. Rindge, Santa Monica; H. V. Carter, G. I. Cochran, W. Gillidere, L. A. Phillips, Los Angeles; W. G. Williams, W. W. Beckett, J. R. Haynes, Pasadena

The River District Light, Heat and Power company, New York city, has been incorporated to manufacture gas and electricity for sale in New York city. The directors of the company are: James Douglas, Cleveland; H. Dodge, E. M. Johnson, William H. Yale, John J. McKilvey, New York city.

W. P. Engle, sole owner of the Charlotte Electric company, Charlotte, Mich., has sold the plant to Hugh H. Holmes of Detroit and John C. Farrer of Brighton, for $40,000.

Newly incorporated electric companies: Utica Electric company, San Francisco, Cal.; Cape Nome Electric Light and Telephone company, San Francisco, Cal.; West Brownsville Electric Light, Heat and Power company, Brownsville, Pa.; Bridgeport Electric Light, Heat and Power company, Bridgeport, Pa.; Sussex County Gas company, Newton, N. J.; Puerto Principe Electric company, Jersey City, N. J.; Kingston Electric company, Colorado, Texas.; Citizens' Electric Light, Power and Heating company, Dayton, N. Y.; Brandon Light and Water company, Brandon, Ore.; Consolidated Electric company, Camden, N. J.; Roslyn Light and Power company, North Hempstead, N. Y.; Guerensey Incandescent Light company, St. Louis, Mo.

Officers and directors have been elected by electric light companies for the ensuing year as follows: Alliance Gas and Electric company, Alliance, O.: L. W. Prior, Cleveland, O., president and treasurer; C. A. Emery, Cleveland, vice-president; W. H. Schott, Chicago, secretary; directors, G. A. Wallace, Chicago; W. A. York, Cleveland; W. W. Emery, Cleveland. Great Barrington Electric Light company, Great Barrington, Mass.: D. Ward Northrop, president; Parley A. Russell, vice-president; Frank H. Wright, clerk; Charles J. Burget, treasurer. Edison Electric Light company, Columbus, O.: Adolph Theobold, president; J. F. Martin, vice-president; Emil Kiesevetter, treasurer; A. W. Field, secretary and general manager.

The York Traction company, York, N. Y., has been incorporated to furnish electricity, by W. H. Lanius, G. Hersh, W. F. B. Stewart, G. S. Millmeyer and J. W. Steacy.

Certificates have been filed with the secretary of state, Albany, N. Y., which formally merge six electric light, heat and power companies into the New York Gas and Electric Light, Heat and Power company, New York City. The merged companies are the Block Lighting and Power company, No. 1; the Borough of Manhattan Electric company, the Manhattan Light-

ing company, the Mount Morris Electric Light company, the New York Heat, Light and Power company, the North River Electric Light and Power company. The total capital stock of the several companies is $3,623,000.

MACHINERY.

The Standard Limestone company, Baltimore, Md., will erect a stone crushing plant of 500 tons capacity a day near Keyser.

Bids are asked until March 1 at Brantford, Ont., for a 12 and 15 ton double engine road roller. R. Waddington, Sec'y; B. P. W.

The O. S. Kelly company, Springfield, O., secured the contract for furnishing a steam road roller to the city of Elgin, Ill., for $3,500.

The purchase of a steam road roller at a cost of $3,000 was decided upon Feb. 5 at Atlanta, Ga. Alderman Day is chairman of the street committee.

The Climax Stone Crushing company, Frederick, Md., has been incorporated by Chas. N. Hargett, Lewis S. Clingan, Harry B. Witter and Arthur Potts.

New York City—Sealed bids are asked until March 1 for furnishing a steam road roller. George C. Clauser, Chmn. Park Comrs., Arsenal, Central Park.

The committee on streets, Newport, R. I., has been authorized to purchase a new steam road roller at a cost of $3,200, and giving the old roller in exchange.

The purchase of a steam road roller is said to be contemplated at Elgin, Ill.

The purchase of a road roller has been recommended by City Engineer Wise at Topeka, Kas.

MISCELLANEOUS.

Plans are being furnished, according to press reports, to combine about fifteen of the sewer pipe plants.

The Northwestern Scraper company, Anderson, Ind., is building an addition to its plant in North Anderson.

The superior court at Spokane, Wash., annulled the charter of the Northwestern Asphalt company Jan. 12.

The Pure Water company of Pennsylvania, Norristown, Pa., has applied for a charter, and will furnish water to Norristown and Plymouth.

The Clinton Gas company, Clinton, Ill., has been incorporated to operate gas and electric plants by Howard L. Olds, William H. Odiore and Edward F. Irwin.

The Metropolitan Crushed Stone company, New York City, has been incorporated by William H. Beach, Urban C. Brewer and William J. Donavan of New York.

The Indiana Bedford Stone company, Bedford, Ind., was incorporated Feb. 23, by O. S. Reynolds, John A. Roe, John B. Elam and Sherman Reynolds.

The Clarion Water company, Clarion, Pa., has contracted with the New York Filter Manufacturing company, 26 Cortlandt-st., New York City, for an improved filtering plant.

A sewer pipe factory will be operated in Mogadore, O., six miles from Akron, and will be promoted by George T. Whitemore and Charles H. Palmer, according to press reports.

Chambers & Hone, 60 New-st., New York City, have become associated with the Pittsburg Testing Laboratory, Pittsburg, Pa., and are now its agents for New York, New Jersey and New England.

The Alabama Supply company, Birmingham, Ala., has been incorporated to deal in and manufacture gas, electrical and plumbing apparatus. The officers are: G. Calvin, president; C. H. Calvin, vice-president; C. E. Jinks, secretary and treasurer.

The town of Gastonia, N. C., has placed a contract with the New York Filter Manufacturing company of New York City, for an improved filtration plant to purify the water supply of that town.

The New York Filter Manufacturing company, 26 Cortlandt-st., New York City, has received an order through John McDougall of Montreal, Quebec, from the town of Smith's Falls, Ontario, Canada, for a filter plant to purify the town water supply.

The Sturtevant Mill company of Boston have just issued a new 1900 circular No. 12, describing their line of crushing and grinding machinery, and also catalogue No. 8 on their fine crushers and centrifugal rolls. These catalogues will be sent free on request.

The Builders' & Traders' Exchange of Racine, Wis., which has just moved into new quarters, solicits catalogues, price lists and samples of all kinds of building materials, as exhibits in the exchange rooms. The secretary, Mr. John M. Driver, suggests that such exhibits will result beneficially to senders.

The Indiana Bermudez company, Indianapolis, Ind., was sold, Feb. 10, to A. A. McKain, who, it is believed, represents other parties in the deal. The company was owned by Allen W. Conduitt and John W. Cooper. These two gentlemen, with S. H. Shearer, also compose the Central Bermudez company, which does business in the cities in Indiana outside of Indianapolis, but it will not be affected by the sale, and will continue in business under the present management.

Water companies have been incorporated as follows: Citizens' Water company, Bloomington, Cal.; Dunbar Water Supply company, Philadelphia, Pa.; Pioneer Water company, of Kern county, San Francisco, Cal.; Charles Offer Water company, San Francisco, Cal.; Montandon Water company, Shamokin, Pa.; West Harrison Water company, Harrison, N. Y.; Medina Water company, Yonkers, N. Y.; People's Water and Power company, of Red Lion, Red Lion, N. Y.; Montgomery Water company, Mt. Sterling, Ky.; Altman Water company, Altman and Colorado Springs, Col.; Rio Grande Water and Power company, Eagle Pass, Tex.; Cambria County Water Supply company, Scranton, Pa.; Kinney Water Supply company, Bellaire, O.

IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Minneapolis, Minn.—Mayor Gray has signed the resolution providing for day labor in the construction of new paving during the ensuing year.

Newark, N. J.—The report of Landscape Architect Olmstead on the proposed speedway in Branch Brook park was submitted Feb. 13. He says that upon examination he found the park too small to admit of such a roadway; that to construct it would necessitate the cutting down of many valuable trees and otherwise destroying the beauty of the grounds.

Detroit, Mich.—Sheehan & Co., engineers and contractors, have suggested to Mayor Mayberry that as a large number of streets in this city, outside of the business district, are wider than is necessary for ordinary traffic a large saving could be effected in paving, repaving and repairing by narrowing them to twenty-two feet from curb to curb.

Buffalo, N. Y.—The New York Central and West Shore railroad companies were granted a writ of certioari Feb. 8 by Justice Kruse for a review and determination of the legality of the assessment for paving Curtiss-st., from Broadway to William. The railroad companies, which own 2,281 feet of land fronting on the street, allege that the street has no sewer in it; that the proposed improvement is no benefit to them, and that the assessment was levied against them on a basis of foot frontage, and without regard to depth, use, benefit or value. The Barber Asphalt Paving company was awarded the contract for the street despite the opposition of the railroad companies.

CONTEMPLATED WORK.

Bristol, Tenn.—Brick paving is contemplated.

Tampa, Fla.—Paving is proposed for Water-st.

Omaha, Neb.—Paving is contemplated for Vinton-st.

Butee, Mont.—The council has decided to pave three streets.

Delray, Mich.—River-st. will be graded, paved and curbed.

Dowagiac, Mich.—Paving is proposed for Front and Commercial-sts.

Savannah, Ga.—Brick or asphalt paving is contemplated for Gaston-st.

Findlay, O.—The question of improving W. Lima-st. is being discussed.

Ann Arbor, Mich.—Paving is contemplated for Huron-st. Geo. T. Key, cy. engr.

Bedford, Ia.—The question of paving Main and Court-sts. is being agitated.

Savannah, Ga.—Brick paving is advocated by Mayor Myers in his annual message.

Springfield, O.—The completion of the speedway this spring is proposed.

Sparta, Wis.—The question of street paving will be considered in the near future.

Herkimer, N. Y.—The extension and improvement of Albany-st. is contemplated.

Atlanta, Ga.—A resolution was introduced Feb. 5 providing for asphalt paving on Peters-st.

Columbus, O.—An ordinance has been passed to issue bonds for improving Champlain-ave.

Watertown, N. Y.—Asphalt paving is contemplated for Factory-st., according to press reports.

Jacksonville, Fla.—The board of public works has authorized brick paving for four streets.

Vacaville, Cal.—This town has voted to issue $80,000 bonds for building macadam roads.

Pittsburg, Pa.—An ordinance has been passed to grade Bennett-st. and pave Diana alley.

Peoria, Ill.—Brick paving is contemplated for Indiana-ave. from Glen Oak-ave. to Ravine.

Chagrin Falls, O.—A petition has been presented to council asking that the business streets be paved.

Mayfield, Ky.—The council is considering the question of issuing bonds for brick paving.

Blackwell, Kas.—The city council has passed an ordinance to pave Blackwell-ave. and Main-st.

Dunkirk, N. Y.—Asphalt paving is proposed for several streets, according to local press reports.

Miami, Fla.—A resolution has been passed to pave Avenue D, between First and Second-sts.

Boonville, Ind.—A petition is being circulated for macamizing Fourth-st. from Gum to Division.

Stockton, Cal.—Macadam paving has been recommended for several streets by the board of public works.

Detroit, Mich.—The board of public works has asked for an appropriation of $300,000 for paving.

Athens, Ga.—The estimated cost of macadamizing Prince-ave., is $25,000. Capt. Barnett, city engineer.

Athol, Mass.—The sum of $13,000 has been appropriated to build a road to the Gay & Ward mills.

Leavenworth, Kas.—Bids will be asked soon for brick paving on Spurce and Fifth-sts.

Elkhart, Ind.—Specifications have been prepared for brick paving on concrete on Beardsley-ave.

Goshen, Ind.—An ordinance has been passed providing for the issue of street improvement bonds.

Owensboro, Ky.—This city will ask for bids soon for brick and asphalt paving. W. M. O'Bryan, Cy. Clk.

Aberdeen, Wash.—The construction of a road more than a mile long to the cemetery is proposed.

Aurora, Ill.—Ordinances were introduced in the council, Feb. 19, providing for the paving of LaSalle-st.

Glenolden, Pa.—This borough is undecided whether to macadamize the streets or build sewers.

Paterson, N. J.—An ordinance has been passed to issue $150,000 bonds for permanent street improvements.

Manchester, N. H.—An appropriation of $29,000 for paving has been recommended by the committee on streets.

Paris, Ill.—(Special.)—Louis E. Fischer, Cy. Engr., says the construction of 9,500 sq. yds. of brick paving is contemplated.

Redondo, Cal.—The question of issuing

$40,000 bonds for sidewalks and sewers will be voted on March 5. S. D. Barkley, Clk.

Crawfordsville, Ind.—This city contemplates constructing about 2 mis. of brick or asphalt paving. F. Hoffman, Cy. Engr.

Lockland, O.—Mayor Davis has called a special election to vote on the issue of $40,000 bonds for street improvements.

Howell, Ind.—The construction of considerable artificial stone paving during this spring is contemplated. Dr. D. A. Cox.

Seattle, Wash.—The estimated cost of paving in nine districts is about $40,000. City Engineer Thompson.

Philadelphia, Pa.—A bill has been passed in the common council appropriating $150,000 for improving suburban roads.

Norwalk, O.—Councilman Lee has suggested that bids be asked for asphalt paving as well as brick paving for Main st.

Hartford, Conn.—The street board has decided upon sheet asphalt paving for five streets and granite for two.

Woodstock, Ont.—The question of paving Dundas-st. is being considered by the board of works. Brick is favored. Town clerk.

Redlands, Cal.—A resolution of intention has been passed to pave three streets with asphalt and one with granite. Board trustees.

New Decatur, Ala.—Mayor E. C. Payne has recommended the issue of $10,000 bonds for improving streets and building new ones.

Peoria, Ill.—Ordinances were passed Feb. 20 for paving La Salle-st. and Indiana-ave. with brick. A. D. Thompson, cy. engr.

Denver, Col.—A petition for paving Detroit-st. from Colfax to Fourteenth with asphalt was referred to the engineer Feb. 15.

Tampa, Fla.—M. E. Gillett, chairman board of bond trustees of West Tampa, is asking for bids for paving, according to local press reports.

Vancouver, Wash.—The council is undecided on the kind of material to use in paving Main-st., brick or wooden block.

Minneapolis, Minn.—The council committee has ordered Third-ave. north and Third-st. south, paved with sandstone.

Kewanee, Ill.—Bids will be asked soon for paving Fremont-st. from First to Prospect, and the alleys in the business district.

Elizabeth, N. J.—The Union county freeholders have decided to build two macadam roads in the county. Bids will be asked in the spring.

Owensboro, Ky.—The city council has passed an ordinance to pave all of the principal streets with brick, asphalt or macadam.

Waukegan, Ill.—The city council has taken preliminary steps towards building two miles of macadam paving this season, at a cost of about $100,000.

Milwaukee, Wis.—Asphalt paving has been recommended for Stowell, Prospect and Farrell-aves., between Folsom place and Linwood-ave.

Muskegon, Mich.—The question of issuing $200,000 bonds for repaving the streets with brick will probably be voted on. C. S. Gamble, cy. engr.

Chicago, Ill.—The question of expending about $700,000 on street improvements is being discussed by the board of public improvements.

Chicago, Ill.—The matter of paving Ridge-ave. from the south limits to Main-st., was referred to the board of local improvements, Feb. 20.

Dunkirk, N. Y.—The city engineer has been directed to prepare plans and specificatons for paving Griswold-st., from Lon to Doty, with brick.

Kansas City, Mo.—The board of public works decided Feb. 16 to pave Thirty-eighth-st., from Warwick to Roanoke, with asphalt.

Moline, Ill.—A petition is being prepared which provides for brick paving on Fifth-ave., from Sixteenth to Seventeenth. Mayor Wessel.

New York City—The board of estimate has authorized a bond issue of $425,456 to pay for extensions and improvements to Riverside drive.

Scottsburg, Ind.—The question of building 15 mis. of macadam roads in Johnson and 31 mis. in Lexington twps. will be voted on March 3.

Parkersburg, W. Va.—The question of issuing $300,000 bonds for brick and macadam paving in the county will be voted on March 13. C. H. Turner, Mayor.

Lewiston, Ida.—A petition has been presented to the board of public works to macadamize about 1,300 lin. ft. of Main-st. E. McCullough, cy. engr.

Williamsport, Pa.—Mayor Williams recommends in his annual message asphalt and brick paving for a number of streets; estimated cost, $45,000.

Moline, Ill.—Asphalt paving is proposed for Sixth-ave., and Mayor Wessel will investigate its merits as a paving material, according to local press reports.

Youngstown, O.—A resolution has been passed to grade, drain and improve Franklin-ave., between Fountain and Flint Hill-st. Wm. I. Davies, cy. clk.

Elkhart, Ind.—Specifications have been submitted for paving Beardsley-ave., from Main to Ward-st., and Main-st., from the bridge to the north side of the avenue.

Waterbury, Conn.—The board of public works has recommended vitrified brick paving for N. Main and N. Willow-sts., and granite blocks for Meadow-st. Mayor Kildorff.

Springfield, O.—A resolution to pave S. Centre-st., from Washington to Mulberry, with vitrified brick or block was adopted by the board of public affairs Feb. 12.

Merced, Cal.—The question of repaving the streets, building sewers, an electric light plant and water works is being considered. W. H. Turner, pres't bd. trustees.

New Rochelle, N. Y.—A resolution has been adopted by the tax-payers directing the city engineer to prepare plans for a boulevard from Rochelle Park to Cooper's Corners.

Zanesville, O.—The estimated cost of paving Main-st. is as follows: 12,955 sq. yds. asphalt, $1.40; 577 sq. yds. concrete, $4; replacing catch basins, $150; total, $20,595. A resolution was adopted, Feb. 13, for the work. Ordinances were also passed to pave Myrtle-ave. and Orchard-st. with brick.

Pasadena, Cal.—An ordinance was passed, Feb. 13, providing for the construction of a portion of a cycleway and path below the South Fair Oaks-ave. Herman Dyer, cy. clk.; W. B. Clapp, cy. engr.

Bellevue, Ky.—The council is considering the question of laying 16,500 sq. yds. of brick or granite paving, and 75,000 ft. of curbing and gutter in Fairfield-ave. E. M. Shinkle, cy. engr.

Utica, N. Y.—Petitions have been presented to the common council for asphalt paving on Cooper and Spring-sts., from Fay to Varick, and to pave Kossuth-ave., Gold and Bleecker-sts., and to repair Main-st. Richard W. Sherman, mayor.

Orange, N. J.—Mayor Stetson, in his message, recommends asphalt paving for Main-st. Ordinances have been passed to flag and curb McChesney-st.; macadamize, pave, flag and curb Mt. Vernon-ave.; flag Lincoln-ave., from Main-st. to Central-ave.

Parkersburg, W. Va.—The city council decided, Feb. 14, to advertise for bids for paving Spring-st. with brick. A motion was also adopted to use cement filler hereafter in all paving. City Engineer Jackson.

Chicago, Ill.—The board of local improvements have made provision for macadam paving for a number of west side streets near the W. Fortieth-ave. system. The board also voted to pave W. Monroe and Lexington-sts. with asphalt.

Kansas City, Mo.—The park boards decided, Feb. 7, to readvertise for bids for paving Benton boulevard, from Fifteenth to Twenty-fourth-st. The board of public works has recommended asphalt and brick paving for a number of streets.

Indianapolis, Ind.—Resolutions were adopted Feb. 21 for asphalt paving and cement walks and stone curbing in Bird-st., from Ohio to New York; brick paving in Court-st., from Liberty to Noble; Maryland, from Alabama to New Jersey, and an alley; cement walks in Ingram and Weghorst-sts.

Indianapolis, Ind.—A tract of land, owned by Henry Weghorst, which lies between East, Wright, Downey and Weghorst-sts., has been purchased by a syndicate of local and Evansville capitalists and will be subdivided into building lots and sewers, sidewalks and other improvements will be made.

Flint, Mich.—(Special.)—A. W. Hay, cy. engr., desires catalogues of paving materials, catch basins, vitrified brick, tar fillers, etc. The city contemplates doing considerable paving during the coming season. Catalogues, samples, etc., should be addressed to A. W. Hay, cy engr.

Terre Haute, Ind.—The Board of Public Works contemplates the improvement of Popular-st., from First-st. to the city limits by grading and graveling and curbing and cement sidewalks. Concrete walks and curbing are also proposed for Chestnut-st., from Third to Thirteenth.

Alton, Ill.—A petition has been circulated by Alexander Wegener, alderman, for brick paving on what is known as the Vandalia road, and ordinances will be passed at once so that the work may be done this year. Union, Henry, Liberty, Grove, Fifteenth and Washington sts. and Belleview ave. will also be paved.

Cedar Rapids, Ia.—Macadam paving is recommended for the residence streets of the city. The principal streets are paved with brick, which give perfect satisfaction, while the asphalt paving on First-ave., between Tenth and Thirteenth sts., is regarded as the finest paving in the city, but it is the belief of interested property-owners that the cost of asphalt for residence streets will be too great.

CONTRACTS TO BE LET.

Carthage, O.—Bids are asked until March 6 for macadamizing portions of Third and Fourth-sts. L. Hall, vil. clk.

Buffalo, N. Y.—Bids are asked until March 6 for paving and repaving numerous streets. R. G. Parsons, sec. B. P. W.

Marietta, O.—Bids are asked until March 17 for paving portions of four streets with brick. Carl Becker, cy. clk.

Vevay, Ind.—Sealed bids are asked until March 7 for gravel and macadamized roads in Posey twp. John F. Houze, co. audt.

Battle Creek, Mich.—Bids are invited until March 5 for furnishing about 2,400 sq. yds. of paving brick. G. W. Hamm, rec.

Spokane, Wash.—Bids are invited until March 1 for laying about 12,700 sq. yds. of asphalt paving on First-ave. Otto A. Weile, cy. engr.

Chamberlain, S. D.—Bids are asked until April 23 for building two additional grades in Pukwana township. Lee L. Henegar, co. audt.

Akron, O.—(Special.)—Bids are invited until March 10, for 35,000 sq. yds. of block or sheet asphalt paving on concrete on Market-st. J. W. Payne, Cy. C. E.

Billings, Mont.—Bids are asked until March 8 for grading and constructing the Zimmerman county road and the Laurel bridge county road. N. G. Carvile, co. clk.

Woodbury, N. J.—Bids are asked until March 10, for building about 6 miles of macadam and 10 miles of gravel roads in Gloucester county. E. G. Miller, dir. bd. chosen freeholders.

Sandusky, O.—(Special).—Sealed bids will be received until March 2 for paving N. Depot-st., 10,958 sq. yds., with brick, block, asphalt or sheet asphalt. John W. Miller, cy. engr.

Duluth, Minn.—Sealed proposals will be received until March 12 for setting in place concrete footing blocks and building in place concrete superstructure north pier, Duluth ship canal. Clinton B. Sears, major engrs.

Waukesha, Wis.—Sealed proposals are asked until March 21 for 10,832 sq. yds. of brick paving; 120 lin. ft. cast iron gutter bridges; three catch basins rebuilt; three catchbasin covers; two lamphole covers. M. M. Maxon, chmn. B. P. W.

New York City.—Sealed bids are asked until March 1 for furnishing and delivering crushed trap rock and trap rock screenings; Marcellus shale sandstone screenings; blue limestone screenings; and twelve ton steam road roller. George C. Clausen, chmn. park comrs. Arsenal, Central park.

Cincinnati, O.—Sealed bids are asked until March 9 for paving and repaving and repairing all brick sidewalks in the eastern and western sidewalk districts. George H. Spellmire, clk. B. C. A. Sealed bids will be received until March 20 for grading grounds and roads, constructing drains, excavation of basins and revelments of

slopes on the water works grounds, near California. Charles G. Roth, clk. bd. trustees W. W. comrs.

CONTRACTS AWARDED.

Elgin, Ill.—The contract for paving Chicago-st. with brick has been awarded to A. E. Rutledge of Rockford.

Bay City, Mich.—H. Campbell was awarded the contract Feb. 5 for paving First-st. with brick for $21,132.61.

Grand Rapids, Mich.—The contract for graveling Cherry-st., from S. Division to S. Ionia, was awarded to A. Pranze Feb. 9 for $2,521.90.

Cleveland, O.—The contract for paving Garden Park-ave. with limestone macadam has been awarded to Spence Bros. for $29,000.

Winona, Minn.—The Biesanz Stone company has been awarded a contract for constructing a stone walk along Central park at 17½ cents per square foot.

Toledo, O.—George L. Holder submitted the lowest bid Feb. 19 for paving Hicks-st., from Washington-st. to Forest-ave., with brick at $1.40 a square yard.

Mt. Holly, N. J.—J. F. Shanley, Philadelphia, submitted the lowest bid Feb. 6 for building three 8-inch macadam roads, aggregating about 4 1-10 miles.

New York City.—Bids were received Feb. 6 for furnishing 10,000 brls. of Portland cement as follows: John Earley's Sons, $1.89½ per brl.; Sparrow, Fridenberg & Co., $1.91; John P. Kane company, $2; Manhattan Supply company, $2.44 4-10.

Jacksonville, Ill.—John Cherry was the lowest bidder Feb. 12 for paving the public square, Sandusky and N. Church-sts., at prices ranging from $17,400 to $19,250 for the public square, and from $6,000 to $7,000 for the streets.

Mt. Vernon, N. Y.—Bids were received Feb. 6 for improving and grading W. Chester-ave. as follows: Peter Sheridan, $6,405; Charles Sillery, $6,447; Quatman & Light, $7,866; Cartright & Kenton, $8,216; Frank Nordone, $7,395.

Hartford City, Ind.—The county commissioners awarded contracts for three gravel roads, Feb. 8, as follows: Hoover road, Granville Phillips, $4,840; Dundee pike, $9,681.74, and Weller gravel road, $11,134.80, Modlin Bros.

New Orleans, La.—The Barber Asphalt Paving company was the only bidder Feb. 12 for paving Custom House-st., from Royal to N. Peters, and Prytania, from Calliope to Clio, with asphalt, at $2.90 a sq. yd. The bids were referred to the city engineer.

Detroit, Mich.—Bids were received Feb. 5 for asphalt paving on Canfield-ave., John R.-st. and Grummond-ave., the lowest being that of James Hawley, at $2.13, $2.67 and $2.91, respectively. The council committee on streets has postponed action on the bids.

Jacksonville, Ill.—(Special.)—The contract for brick paving was awarded Feb. 12 to John Cherry, Jr., of this city, as follows: Public square, Poston block, Murphy's grout filler, $19,214; N. Church-st., Clinton block and Murphy's grout filler, $6,050; Sandusky-st., Clinton block and Murphy's grout filler, $6,900.

St. Paul, Minn.—The board of public works awarded asphalt paving contracts to the Barber Asphalt Paving company Feb. 15 as follows: Summit-ave., from Rice to Sixth, $6,916.44; Farrington-ave., Nelson to a point near Summit-ave., $10,092.10; Sherburne-ave., Cedar-st. to eastern terminus, $3,950. L. G. Washington secured contracts for cement walks for $15,041.

Galveston, Tex.—Contracts for furnishing paving materials were awarded Feb. 15 as follows: Green & Hunter Brick company., common brick, $13.55 per 1,000; George H. Henchman, city, Bornsberg Portland cement, $2.45 a bbl.; W. H. Hayden, Cedar Boyar, Fix. sharp sand, $1 per cu. yd.; Galveston Cement & Pipe works, crushed stone, $2.85 a cu. yd.

Chicago, Ill.—The contract for paving the streets on each side of Campbell Park, from Oakley-ave. to Leavitt-st., was awarded Feb. 13 to the Bermudez Asphalt Paving company at $2.19 a sq. yd. for paving; four new catch-basins, $35 each; repairing 5 catch-basins, $27 each; repairing 6 manholes and putting on iron covers, $24 each.

Allegheny, Pa.—The Sicilian Asphalt Paving company, New York City, has been awarded the contract for paving Termon-ave., as follows: 12,000 cu. yds. excavation, 32 cts.; 200 cu. yds. second-class masonry, $7; 6,500 sq. yds. sheet asphalt, $2.60; 3,500 lin. ft. curb, 53 cts.; 17,500 sq. ft. flagstone sidewalk, 21 cts.; 8 sewer inlets reset, $30; 8 manholes adjusted to grade, $20; 150 ft. binder, 25 cts.; total, $28,107.

Leavenworth, Kas.—Contracts for paving Shawnee, N. Esplanade and Main-sts. were awarded Feb. 7 to the Gilsonite Paving company of St. Louis, Mo. This action of the council's in awarding the contract is severely criticised, for the bids offered for Shawnee-st. had been rejected and the advertisement for new bids published, and it is generally believed that the action of the council will be proved illegal and the cost of paving the street fall on the tax-payers of the city at large. The contract price for Main-st. was $1.98 and for N. Esplanade $1.88 a sq. yd.

Mexico, Mex.—Bids for asphalt paving in a number of streets have been received as follows: The bids are based on the square meter for classes A, B and C, respectively: Barber Asphalt Paving company of New York City, $13, $12, $11; Assyrian Asphalt company, Chicago, Ill., $9.50, $8.50, $7.60; Neuchatel Asphalt Paving company, New York City, $10.85, $9.35, class C, the same price as the bidder supposes is being paid at present, or cost price with 10 per cent. profit. The bids were rejected and the commissioners of finance and public works were instructed to enter into a contract with one or more of the companies which submitted bids.

Buffalo, N. Y.—Bids were received Feb. 14 for paving Utica-st. and Anderson-place, as follows: Utica-st., between Rhode Island and Main-sts.—Barber Asphalt Paving company, asphalt, $12,669; P. B. McNaughton, brick, $6,466. Utica-st. from Main to Jefferson—Barber Asphalt Paving company, asphalt, $6,455; P. B. McNaughton, brick, $7,160. Anderson Place—H. P. Burgard, asphalt, $7,000; P. B. McNaughton, brick, $7,195. Bids were received Feb. 8 for asphalt and brick paving in a number of streets, the lowest being as follows: Barber Asphalt Paving company—Orton-place, $3,546; Clinton-st., $7,457; Keystone-st., $23,345; Lewis-st., $5,672; Ketcham-ave., $3,229;

Wells-st., $4,231; Michigan-st., $12,841; Lock-st., $1,951. American Contracting company—Trowbridge-st., $14,750; Dole-st., $8,100; Prenate-st., $3,130. German Rock Asphalt company—Marion-ave., $6,298.

SEWERS.

Cleveland, O.—City Engineer Ritchie discovered Feb. 4, that contracts have been let by the previous administration for $46,000 more than the city had on hand for that purpose. He claims that the error was made in certifying that there was $46,000 more in the sewer fund than there really was.

Detroit, Mich.—Fred Gardner, who has the contract for building a 3 ft. 4 in. x 5 ft. brick sewer in McClellan-ave., north of Gratiot, is encountering considerable difficulty owing to quicksand. He has found it necessary to build a trench 22 ft. deep and closely sheeted with planks, owing to the inability of his men to tunnel. The fulfillment of the contract will cost him $1,000 more than the contract price. Contractor Porath is having the same trouble on Gratiot-st., near McClellan, and his loss will be $2,000.

CONTEMPLATED WORK.

Aitken, Minn.—A sewerage system is contemplated.

Mt. Jewett, Ia.—The construction of a sewer is contemplated.

Princess Anne, Md.—Bonds will be issued for a sewerage system.

Hudson Wis.—Additional sewerage facilities are contemplated.

Fond du Lac, Wis.—A sewerage system is proposed for North Fond du Lac.

Glevolden, Pa.—The question of building sewers is being considered.

Grand Rapids, Mich.—Bids will be readvertised for a sewer in N. Front-st.

Kansas City, Mo.—A system of district sewers is proposed to tap the Vine-st. sewer.

Helena, Ark.—An ordinance was passed Feb. 7 creating sewer district No. 1. Mayor Barlow.

Wellsville, O.—The city council has declared its intention of building a storm water sewer.

Oxford, Miss.—The sum of $20,000 has been voted for sewers. W. B. Cowan, mayor.

Emeryville, Cal.—Plans for 20,000 ft. of 6-in. to 2-ft. sewers have been prepared.

Reondo, Cal.—The question of issuing $40,000 sewer bonds will be voted on March 5.

Wabash, Ind.—The property-owners on Sinclear-st. have petitioned for a sewer.

Irvington, N. J.—The establishment of an independent sewerage system is proposed.

Ottawa, Ont.—Plans for the proposed subsidiary drainage for the Glebe have been prepared.

Conemaugh, Pa.—This town voted to issue bonds for sewers and electric lights.

Decatur, Ind.—The construction of a salt glazed tile sewer to be known as Front sewer, is contemplated.

Utica, N. Y.—Plans for 15 and 20 in. pipe sewers in ward 7 are being prepared by Cy. Surv. Schultze.

Brooklyn, N. Y.—There is urgent need of sewers at Coney Island, according to press reports.

Atlanta, Ga.—A resolution was introduced Feb. 5, calling for a bond election for trunk sewers.

Truro, N. C.—Plans for a sewerage system are being prepared by F. C. Coffin, 53 State-st., Boston.

El Reno, Okla. T.—The proposed sewerage system will include 15,364 ft. 12-10-8-6 in. pipe sewers.

Sault Ste. Marie, Mich.—J. A. Lawrie, cy. engr., recommends the construction of a trunk sewer.

Bedford, Ind.—The council has ordered plans for a sewerage system. G. C. Houston, cy. engr.

Lead, S. D.—The question of issuing bonds for a sewerage system will be voted on.

Luverne, Minn.—A petition for a sewerage system has been presented to the council.

Highland Park, Mich.—The question of extending the sewerage system will be voted on.

Niagara Falls, N. Y.—The question of building a sewer on Buffalo-ave. is being considered.

Alton, Ill.—A petition is being circulated asking for a sewer on Spring-st., from Sixth to Union.

Winona, Minn.—The question of building the second sewerage district will probably be taken up soon.

Crawfordsville, Ind.—The construction of about one mile of sewers is contemplated. T. Hoffman, cy. engr.

Wilmington, N. C.—Plans have been prepared for a system of surface drainage. Jos. H. McRee, cy. engr.

Greenville, O.—The construction of about fifteen and one-half miles of sewers is contemplated. W. D. Brumbaugh, cy. engr.

Beverly, Mass.—An ordinance is being considered which empowers the mayor and aldermen to build sewers.

Reading, Pa.—The city engineer will make plans and ask bids for a storm water sewer in Ninth-st.

Keokuk, Ia.—The sewer committee estimates the cost of proposed sewer work for this year at $15,000.

Laconia, N. H.—The construction of sewers at the Weirs is contemplated. William Nelson, supt. sewers.

Norwood, O.—The construction of about 1,000 feet of twelve inch pipe sewer is contemplated. A. E. Wichgan.

Pomona, Cal.—The question of issuing $30,000 bonds for sewers will be voted on about May 1.

Visalia, Cal.—The question of building sewers in a new sanitary district will be voted on March 31.

Orange, N. J.—A resolution was adopted Feb. 19 to extend the storm water sewer in S. Jefferson-st.

Minneapolis, Minn.—The council committee has authorized the construction of sewers at a cost of $8,000.

Ridgefield, Conn.—Plans for a sewerage system will be made by T. H. McKenzie, engr. state board of health.

Canton, O.—About ten miles of six to eighteen inch pipe will be required for sewering district No. 1. Philip H. Weber, cy. engr.

Mansfield, O.—F. Herbert Snow recommends the construction of a sewerage disposal plant at a cost of $85,547.

Benton Harbor, Mich.—The board of public works contemplates building a new sewerage system for Norton Hill.

Murphysboro, Ill.—The city council has passed a resolution to extend the sewerage system in the new West End.

Moline, Ill.—The construction of a sewer and drainage system into the Mississippi river is contemplated.

Atlanta, Ga.—Ordinances are pending in the council for sewers in Chapel, Leonard and Plum-sts. W. D. Greene, cy. clk.

Newport, Pa.—The question of issuing $16,000 bonds for a sewerage system will be voted on March 6. Samuel Clay, Ch. Burgess.

Bernard, O.—Plans for a sewerage system have been prepared; estimated cost, $200,000. J. C. Stewart, vil. engr.

Bloomington, Ill.—A resolution was introduced Feb. 15 to increase the sewerage system of the West Side. Cy. Engr. Folsom.

Sandusky, O.—Ordinances were adopted Feb. 5 for the construction of sewers in Hendry, Lindley, Campbell and Putnam-sts.

Omaha, Neb.—The question of issuing $75,000 bonds for completing the sewerage system of North Omaha is being considered.

Princeton, Ill.—The construction of about five miles of sewers is contemplated. Alvord & Shields, 127 Hartford building, Chicago, engrs.

Perry, N. Y.—A bill has been introduced to amend the village charter of this city for the construction of a sewerage system.

Malden, Mass.—The mayor has been authorized to petition the legislature for the right to borrow $200,000 for surface drainage.

Hamilton, Ont.—The sewer committee decided Feb. 17 to advertise the city's intention to build two sewers, aggregating 66,800 feet.

Indianapolis, Ind.—The construction of a main sewer in Michigan-st., with laterals, is contemplated. Joseph T. Fanning, chmn. B. P. W.

Kansas City, Mo.—Plans have been prepared for 7,500 feet of brick sewers and 15,000 feet of pipe sewers, including 60 manholes and 10 flush tanks.

Pasadena, Cal.—An ordinance has been passed to extend and complete the municipal sewerage system. Herman Dyer, cy. clk., W. B. Clapp, cy. engr.

Washington, D. C.—The District commissioners have ordered the construction of main and pipe sewers and catch basins in a number of streets.

Martin's Ferry, O.—An ordinance has been passed providing for the construction of sewers in sewer district No. A. Ellis D. Lash, cy. clk.

Camden, O.—The council has directed the county engineer to prepare estimates of the cost of the proposed extension of the Hendrix-st. sewer.

Findlay, O.—The board of improvements has recommended the construction of an outlet sewer on E. Hardin-st. to the river, and a sewer in E. Lima-st.

Toronto, Ont.—The committee on works has recommended the sum of $7,000 be appropriated for obtaining information regarding sewage disposal.

Reading, Mass—A committee has been appointed to investigate and report upon the most favorable plan for sewage disposal. Louis M. Bancroft, chmn. sewer com.

Mansfield, O.—The plans prepared by Snow & Barbour of Boston for sewerage and garbage disposal have been approved by the state board of health.

Paris, Ill.—(Special.)—This city contemplates the construction of mains from a separate system of sanitary sewerage. Louis E. Fischer, C. E.

Canton, O.—The sewer commissioners approved Feb. 12 the plans of City Engineer Weber for a main trunk sewer and about 35 laterals in "sewer" district No. 1.

Harrison, N. J.—An ordinance has been passed to build a sewer in Cleveland-ave., from Fourth to Fifth, as a mark of respect to the late Alderman Wade.

Scranton, Pa.—Plans and specifications for the proposed relay sewers to relieve the First and Second districts are being prepared by City Engineer Phillips.

Indianapolis, Ind.—Resolutions were adopted Feb. 21 for a local sewer in Michigan-st., and an alley. A petition was also filed for a sewer in Yandes-st.

Springfield, O.—About $20,000 will be expended for dredging Buck creek and otherwise improving that portion of the sewerage system. Philip Huonger, cy. clk.

Laurel, Miss.—A contract for making plans and specifications for a sewerage and water works system has been awarded to Charles P. Chase, city engineer of Clinton, Ia.

Pontiac, Ill.—The common council and board of public works will give a hearing March 5 on the proposed construction of a lateral sewer in Oakland-ave. E. E. Hymers, cy. clk.

North Tonawanda, N. Y.—Plans and specifications are being prepared and bids will be asked soon for the construction of sewers in the Ironton district; estimated cost, $30,000.

Portland, Ore.—Plans are being prepared by the city engineer for the main sewer on the Beech-st. system. The proposed sewer will be an 80-in. brick one, with stone inverts; estimated cost, $40,000.

Baton Rouge, La.—R. F. Hartford, cons. engr. of Hartford & Co., Atlanta, Ga., will assume control and direct the survey preparatory to the establishment of a thorough sewerage system in this city.

Grand Island, Neb.—(Special.)—Arnold C. Koenig, co. surv., says a petition is being circulated for 3,000 ft. of 8-in. sewer extensions in sewer district No. 7, and 720 ft. 15 in. pipe sewer in Locust-st.

York, Pa.—The bill providing for a loan of $350,000 for the construction of a sewerage system and city hall, has been postponed. The electors were to have voted on the matter at the coming municipal election.

Chicago, Ill.—The construction of a main outfall sewer, 9½ ft. in diameter at the canal and decreasing in size to 7½ ft. at Fifty-ninth-st., is contemplated for Western-ave; estimated cost, $800,000.

Lakewood Hamlet, O.—The plans prepared for a sewerage system by F. Herbert Snow of Boston were approved Feb. 10. The plan provides for two systems—one for sewage and one for storm water. Prof. H. W. Elliott, chmn.

Minneapolis, Minn.—The council committee recommends the extension of the sewer from Twenty-seventh-st. and Lake of the Isles boulevard to the Peavey fountain, at St. Louis park, thence to the city limits; estimated cost, $40,000.

Columbus, O.—A bill for a $325,000 bond issue for the new sewerage system has been prepared by Mayor Swartz, which will be voted upon by the citizens. Alvord & Shields, cons. engrs., The Rookery, Chicago. O. A. Miller, Jacob Lind, Councilman Wiecherg, com.

Scranton, Pa.—(Special.)—Joseph P. Phillips, cy engr., says the proposition to increase the indebtedness of the city in the sum of $273,000 for constructing sewers was favorably voted on Feb. 20, as follows: for increase, 3,000; against increase, 2,869; majority for increase, 131.

Rockford, Ill.—The special assessment proceeding pending in the county court for the construction of two miles of sewer in E. State, Charles, Ninth and other streets, has been dismissed, and if the improvement is made this year it will be necessary for the property owners to get up a new petition.

CONTRACTS TO BE LET.

Walla Walla, Wash.—Bids are asked until March 13 for a sewerage system. Jacob Betz, mayor.

Cleveland, O.—Bids are asked until March 1 for a sewer in Muirson-st. W. P. Rice, dir. pub. wks.

Akron, O.—Bids are asked until March 10 for sewers in Yale and Harvard-sts. Chas. H. Isbell, cy. clk.

Bloomington, Ill.—Bids are asked until March 1 for about 12,000 ft. of 27 to 8-in. sewer pipe. J. G. Melluish.

Amsterdam, N. Y.—Bids are asked until March 1 for building 875 ft. of 30-in. pipe sewer. F. E. Crane, supt. sewers.

Grand Junction, Col.—Bids will be received until March 13 (extension of time), for sewer construction. M. O. Delaplain, cy clk.

Canton, S. D.—Bids are asked until March 5 for building 3,600 ft. of 15-8 in. pipe sewers. D. B. Howe, cy. engr.; A. Helgerson, cy. clk.

Roswell, N. M.—Sealed bids will be received until March 13 for constructing a sanitary sewer system. J. P. Church, mayor; B. F. Hammett, jr., clk.

Houston, Tex.—Sealed bids are asked until March 12 for sewerage pumping machinery, brick and cast iron pipe sewers. S. H. Brashear, mayor.

Washington, D. C.—Sealed proposals will be received until March 8 for constructing a sewerage and water system near Hayward, Wis. W. A. Jones, comr. Indian affairs.

Pipestone, Minn.—Sealed bids are asked until March 7 for constructing a sewerage system at the Indian school. D. S. Harris, supt.; W. A. Jones, comr. Indian affairs, Washington, D. C.

Denver, Col.—Sealed bids are asked until April 17 for buildings sewers with manholes, etc., in sub-districts No. 18 and 21 of the Capitol Hill storm sewer district No. 1. Joel W. Shackelford, prest. B. P. W.

Fort Wayne, Ind.—Sealed proposals will be received until March 5 for the construction of a main sewer, consisting of 11,831 lin. ft. of 6 ft. 2 ring, and 2,019 lin. ft. of 5 ft. 2 ring brick sewer. A. M. Schmidt, clk. B. P. W.

CONTRACTS AWARDED.

Reading, Pa.—The contract for building a sewer in Eleventh-st., was awarded to J. G. Yarnell, for $1,647.

Seattle, Wash.—The contract for building the Jackson-st. sewer was awarded to Stirrat & Goetz, for $2,773.

Sea Isle City, N. J.—A franchise to build and operate a sewerage system has been granted to the Sea Isle City Sewerage company.

Martinsville, Ind.—The contract for constructing a sewerage system was awarded Feb. 10, to J. P. Thompson of Greensburg, Ind., for $43,800.

Bloomfield, N. J.—The contract for building the State-st. storm drain was awarded, Feb. 19, to Lansillo & Tighe of East Orange, for $3,889.50.

Racine, Wis.—Peter B. Johnson secured the contract, Feb. 10, for building the extension to the English-st. brick sewer, at $6.20 a lin. ft.

Atlanta, Ga.—Bids were received Feb. 5, for sewer work, as follows: W. A. Hancock & Co., $21,485; Frank E. Lake, $22,922; W. W. Griffin, $20,743.

Walla Walla, Wash.—The contract for furnishing 23 miles of 24-6 in. sewer pipe has been awarded to the Denny Clay company, Seattle, Wash., for $30,379.

Kansas City, Mo.—The contract for constructing the south section of the Vine-st. sewer, from Twenty-sixth to Thirtieth, was awarded, Feb. 10, to Michael Walsh, for $25,519.

Monticello, Ind.—(Special)—The contract for the J. M. Conway et al. ditch was awarded by Web. P. Bushnell to J. L. Taylor of Royal Center, Ill., at 11½ cents a cu. yd.

Pueblo, Colo.—Piper Bros. secured the contract for 4,150 ft. of 8-in. pipe, and J. H. McCabe 7,350 ft. of 8-in. pipe sewers, at an average cost of 50 cents a ft; manholes, $60; flush tanks, $97.

Spokane, Wash.—Bids were received Feb. 14, for a sewer in First-ave., from Stevens to Washington-st., as follows: J. C. Broad, $2,696.26; Fife & Conlan, $2,565; August Ilse, $2,400; Ryan & McNairn, $2,620; J. Costello, $1450.

Denver, Colo.—The lowest bids submitted Feb. 13 for the construction of sewerage systems in two sub-divisions of the Capitol Hill storm sewer were: Sub-district 18, J. P. O'Neil, $10,410.54; sub-district 22, J. I. O'Rourke construction company.

Kansas City, Kas.—(Special)—S. G.McLoon, cy. engr., says the contract for 5,190 ft. of 72-66-60-in. 3-ring brick sewer and 1,700 ft. 54 and 48-in. 2-ring brick sewer, with manholes, catch basins, was awarded, Feb. 13, to T. J. Enright, for $46,923.50.

Indianapolis, Ind.—H. C. Roney was awarded contracts for local sewers, Feb. 21, as follows: St. Clair-st., from Massachusetts-ave. to Division-st., 95 cents a lin. ft.; St. Clair-st., from Pine-st. to C., C., C. & St. L. tracks, 64 cents; St. Clair-st., from Dorman to Pratt, 73 cents.

Champaign, Ill.—Bids were received Feb. 14 for the construction of a brick sewer, as follows: J. H. Green & Sons, Appleton, Wis., $13,117.20; Knowles & Price, Jacksonville, Ill., $14,202.25; Farrer & Peters, Terre Haute, $15721.50; J. H. Roach, Chicago, $15,543.75; Norton & Gilmore, Terre Haute, $15,618.75; W. A. Edgar, Cedar Rapids, Ia., $15,806.40; Wm. Horrabin, Iowa City, Ia, $15,586.40; Gracomo Maffiolo, Rockford, Ill., $16,107.62; Webster & Blake, Dubuque, Ia., $18,904.75. The contract was not awarded.

WATER-WORKS.

Lacona, N. Y.—Water storage tanks under air pressure have been installed as a part of the new water works system.

Uvalde, Tex.—The Uvalde water works were sold Feb. 6 at trustee sale, to John F. Simpson, for $15,900.

Belleville, Kas.—The advisability of purchasing the water works plant is being discussed by the city.

Jersey City, N. J.—This city voted Feb. 13 to purchase the new water plant, which is being built by P. H. Flynn at a cost of $7,595,000.

Flint, Mich.—The Flint City Water Works company have decided to sell its plant to the city, the price to be fixed by arbitration.

St. Joseph, Mo.—The city council passed an ordinance Feb. 13, providing for an election to be held March 22 to settle the question of water rates.

Dubuque, Ia.—The Dubuque Water company has decided to accept the offer of the city council to purchase the plant for $545,000. The question will be voted on in April.

Jeffersonville, Ind.—The Jeffersonville Light and Water company has mortgaged its new plant to the American Trust and Savings Bank of Chicago, for $58,000.

Wichita, Kas.—The entire water works system at Greensburg, Kas., has been moved to Alva, Okla. The plant cost Greensburg $40,000 and was sold to Alva for $7,000.

Akron, O.—The contract between the city and the Akron Water Works company was declared illegal Feb 5 by City Solicitor Ergatt, owing to its not having been ratified by a vote of the people.

Marinette, Wis.—The water company has agreed to erect a filter and the city will pay the interest on the investment until the expiration of the present franchise, which will be in about seven years, and then purchase the filter in case the franchise is not extended.

Trenton, N. J.—The weak and impaired condition of the new reservoir of this city may result in its giving way at any time, according to local press reports, the result of which would be to sweep one-fifth of the town into the Delaware river. The reservoir, which cost $450,000, was not built to a safe depth.

Crown Point, Ind.—Suit has been filed by Perry D. Clark to enjoin the town of Lowell from paying the bonds issued on the water works plant. The system was constructed by a private corporation and, after being completed, was bonded for about $12,000 and then conveyed to the town, subject to the trust deed given to secure the bonds.

Millvale, Pa.—The Bennett Water company filed suit Feb. 7 against the burgess and town council of this town to recover $250,000 damages for an alleged breach of contract in the erection of a water plant. It is claimed that the corporation broke faith with the plaintiff company by erecting its own plant while it had a 24-year contract for water with the company.

Irvington, N. Y.—Suit has been brought against the water commissioners of this village by Gerald F. Grace of Tarrytown, who alleges violation of the labor laws of the state. The village is building water works at a cost of nearly $100,000. Grace alleges that Bart Dunn, the contractor, is making the masons work ten hours a day at $2.50, which is less than is paid elsewhere.

CONTEMPLATED WORK.

Rockville, Ind.—Municipal water works are proposed.

Piqua, O.—Plans are being prepared for a reserved water supply.

Atlanta, Ga.—The water bond election will be held March 14.

Eureka, Neb.—The water works system will be enlarged.

Fond du Lac, Wis.—A water works system is proposed for North Fond du Lac.

Kokomo, Ind.—The council intends purchasing the water works in 1902.

Easton, Pa.—The proposition for establishing water works was defeated Feb. 20.

Eureka, S. D.—The enlargement of the water works system is proposed.

Canton, Minn.—The issue of bonds for a water works system is proposed.

Alton, Ill.—A water works commission will be created to provide municipal water works.

Two Rivers, Wis.—Bonds will be issued for constructing a municipal water works system.

Cheyenne, Wyo.—The extension of the water works is proposed. Walter D. Pease, cy. engr.

Ottumwa, Ia.—The council has decided to take action toward purchasing the water plant.

Sandusky, O.—Water meters will be introduced. Address Merris, Link & Fuchs of water board.

Cleveland, Tenn.—The Cleveland Water company contemplates expending $5,000 for cast-iron pipe.

Helena, Mont.—Bids will be asked about April 1 for a new water supply. F. G. Edwards, mayor.

Vandalia, Ill.—An ordinance was passed Feb. 12 for the extension of the water works system.

Nashville, Ark.—The question of securing a water supply from artesian wells is being considered.

Chester, Ill.—Estimates are being considered for putting in water works at the state penitentiary.

Glens Falls, N. Y.—The erection of a pumping station is contemplated. George P. Slade, cy. engr.

Niagara Falls, N. Y.—The Niagara Falls Water Works company contemplates enlarging the filtration plant.

Auburn, Me.—The water commissioners have voted to purchase 900 ft. of 24-in. water pipe and fittings.

Hull, Que.—Bids will be asked in April for improving the water works. R. F. Farley, cy. surv.

Oakland, Cal.—Estimates for a new water supply and salt sprinkling system have been submitted by M. K. Miller.

Grinnell, Ia.—The question of providing a better water supply is being discussed. G. H. Verbeck, supt. w. w.

Sacramento, Cal.—A proposition to furnish a water, electric light and power plant has been made by William Muir.

Geneva, N. Y.—The board of public works

is considering the question of building a new reservoir of 10,000,000 gals. capacity.

Kansas City, Mo.—The board of public works has approved the ordinance for a water main to supply the Linwood district.

Little Rock, Ark.—The question of improving and enlarging the water supply is being considered. Mayor Woodson

Zanesville, O.—The council committees have recommended the Jewell mechanical filtration system for this city.

Cairo, Ill.—The water committee will report on the plan of substituting artesian well water for river water.

Waterloo, N. Y.—This city is considering a proposition from the Geneva Water company, of Geneva, N. Y., to furnish it with water.

Dunkirk, N. Y.—A bill is before the legislature authorizing the improvement of the water works of this city.

Joliet, Ill.—An ordinance has been prepared providing for the increase of the city water supply 6,000,000 gals. a day.

Monmouth, Ill.—Plans and specifications for improving the water works system have been made by D. W. Mead, C. E., Chicago.

Oakland, Cal.—City Engineer Clement thinks that 110 wells will be needed at Roberts's Landing to supply water for this city

Carthage, Ind.—(Special.)—The board of trustees is considering the construction of a water works and electric light plant.

Farmer City, Ill.—The advisability of purchasing a new pump for the water works system is being considered by the city council.

Springfield, O.—The question of purchasing the Buck Creek water rights to increase the city water supply is being considered.

Apalachicola, Fla.—The Apalachicola Water Works company will purchase supplies for a water works system. T. J. Meginnuss, engr.

Pomeroy, Ia.—The question of forming a private company and installing a water and electric light system is being considered.

Los Angeles, Cal.—Mayor Eaton has recommended that the sum of $140,000 be expended for a filtration system for the water works.

Elyria, O.—Plans and specifications for the new lake water system will be adopted at once by the city council and water works trustees.

Evanston, Ill.—This city is considering a proposition for the rental of 4,000 filters for one year, to be used by consumers.

Bristol, Conn.—The Bristol Water company has purchased land and will increase the water supply and build new reservoirs.

East Cleveland, O.—The question of issuing additional $50,000 bonds for the extension of water mains will be voted on March 7.

McGregor, Ia.—An ordinance has been passed providing for the establishment of a water system in connection with the new water system.

The question of issuing bonds for water works has been favorably voted on at the following places: Enid, Ok.; Yreka, Cal.; Fort Pierre, S. D.

Orange, N. J.—The common council is considering a proposition to establish a filtration plant at the new water works at Campbell's Pond.

Tacoma Park, Md.—Bids will be asked soon for a water works and sewerage system. A gasoline engine, pump and elevated tank will be required.

Michigamme, Mich.—Supervisor Murray has been instructed to procure estimates of the cost of installing a water system and for a steam engine.

Wallington, N. J.—The question of a new water supply is being considered. The question will probably be voted on March 13. Mayor Van Bussam, P. O. Passaic.

Atlantic City, N. J.—The water supply will be increased by the construction of a 24-in. main across seven miles of meadows from the pumping station on the mainland.

Utica, N. Y.—An engineer will be employed to investigate the water works question. R. H. Wicks, T. R. Proctor, E. L. Wells and others are interested.

Dansville, N. Y.—The question of appropriating $9,000 for the acquisition of an additional water supply to be taken from Little Mill creek, will be voted on.

The question of water works is being agitated at the following places: Fremont, Ia.; Casey, Ia.; Dassel, Minn.; Appleton, Minn.; Maysville, Mo.; Pottstown, Pa.; Pierre, Neb.

Dayton, O.—Bids will be asked in March for 1,900 ft. 66x3⅛ in. riveted steel pipe and 9,500 cu. yds. excavation and backfilling for same. C. E. Rowe, secy. w. w.

Omaha, Neb.—The question of issuing $3,000,000 bonds for purchasing the water works or land thereof will be voted on March 6. F. Moores, mayor; Beecher Higby, cy. clk.

Laurel, Miss.—Chas. P. Chase, of the Iowa Engineering company, Iowa City, Ia., has been awarded the contract for making complete plans and specifications for water works and sewerage systems for this city, estimated cost, $50,000.

Port Allegheny, Pa.—(Special.)—Samuel W. Smith, secy. Port Allegheny Water company, says the plant will be materially increased during the present season, and the company will be in the market for 4-6-8-in. pipe, with valves and other appliances.

The question of issuing bonds for water works systems will be voted on as follows: Slayton, Minn., March 13; Lockhart, Tex., April 3; Adams, N. Y., March 20; Iola, Kas.; Sonoma, Cal., March; Boulder, Col.; Stillwater, Ok., March 13.

Worcester, Mass.—The legislature will be petitioned to authorize this city to build three new reservoirs along the Kettle river and to put in additional water mains. F. A. McClure, cy. engr.; R. B. Dodge, jr., mayor.

Cincinnati, O.—The cost of pipe and special castings is estimated by Chief Engineer Bouscaren as follows: Straight socket and spigot pipes, 926 tons at $31; straight-flange pipes, 29 tons at $65; special castings, sacket and spigot, 70 tons at $65; special castings, flanged, 27 tons at $75; miscellaneous castings, 8 tons at $75; total, $37,766.

The construction of water works systems is contemplated at the following places: Pukwana, S. D.; Hagerstown, Ind.; Lafayette, Col.; Waltham, Ia.; Waverly, Neb.; Horseheads, N. Y.; Columbia, S. C.; Clayton, Del.; Osakis, Minn.; Mountain Lake, Minn.; Randolph, Neb.; Springfield, Minn., Stephen, Minn

Richmond, Va.—The annual cost of purifying the city water supply is estimated by Chas. E. Bolling, supt., as follows: Sedimentation, $9,200; sedimentation and sand filtra-

tion, $40,120; sedimentation and mechanical filtration, $36,876.50; sedimentation and coagulation, $44,728.42 and $28,668.42, according to the coagulent used.

Salt Lake City, Utah—The committee on water works has recommended the adoption of City Engineer Kelsey's plans to improve the pipe distribution system. The plans contemplate the laying of a new main from the City creek, a series of main pipes on certain streets, and the completion of the east bench reservoir; estimated cost, $160,000.

CONTRACTS TO BE LET.

Needham, Mass.—Bids are asked until March 8 for sinking a supply well. G. A. Adams, secy. comrs.

London, Ont., Canada.—Sealed bids are asked until March 5 for furnishing and delivering 25-tons ½-in. and 5-tons ¾-in. lead pipe. John M. Jones, engr. and supt.; Wm. Jones, chrmn.

Houston, Tex.—Bids are asked until March 12 for 1,400 tons of water pipe, 20-tons of castings, etc. S. H. Brashear, mayor.

Douglas, Ga.—Bids will probably be asked about March 20 for water works and an electric light plant. W. W. McDonald, mayor.

Lansingburgh, N. Y.—Bids are asked until March 15 for constructing an additional water supply. Wm. M. Lee, chrmn. water comrs.

Washington, D. C.—Sealed bids will be received until March 8 for a water system at the Indian school near Hayward, Wis. W. A. Jones, comr. Indian affairs, Washington, D. C.

Cleveland, O.—Bids are asked until March 17 for two or four 25,000,000-gal. pumping engines for the Kirkland-st. pumping station, and a 20,000,000-gal. engine for the Division-st. pumping station. Walter P. Rice, dir. pub. wks.

Fossil, Ore.—Sealed bids are asked until March 6 for constructing water works, to consist of 12,000-ft. 2½-in., 2,500-ft. 2-in., 3,600-ft. 6-in., and 1,400-ft. 8-in. pipe, hydrants, castings, and a 150,000-gal. cement-lined reservoir. H. Stokes, recdr.

Cincinnati, O.—Sealed proposals will be received until April 17 for four self-contained vertical, triple expansion, crank and fly wheel pumping engines of 30,000,000 gals. each, an electric crane, and boilers. August Herrmann, prest. bd. trustees, water comrs.

CONTRACTS AWARDED.

Elkins, W. Va.—Rosser & Casto, Bellaire, O., secured the new contract for the construction of water works.

Carbondale, Ill.—The contract for building a water works system was awarded to C. A. Iglehart & Co. for $77,000.

Monticello, Ark.—The contract for a complete water and light plant was awarded to G. Jaeger of Carthage, Mo., for $24,985.

Johnstown, N. Y.—The contract for building a new water works at Sacandaga park has been awarded to Clinton Beckwith of Herkimer.

Rosedale, Kas.—C. Jaeger, Rich Hill, Mo., secured the contract for constructing a system of water mains in this city for $21,400.

Ponca City, Ok.—The city council rejected all bids Feb. 11 for the construction of a water works system. Contracts were then made for material with the Chicago Bridge and Iron company, the Washington Pump company, the Erie Boiler Works, the Corey Hydrant company, and the Colorado Pipe company. B. F. Evans, Newton, Kas., was employed to superintend the construction on behalf of the town. The system will cost $25,000.

Ft. Wayne, Ind.—Bids were received Feb. 19 for nearly 3 miles of brick sewers as follows: Earler & Peter, Terre Haute, $13 a lin. ft.; John T. Adams, Columbus, O., $14.56; Thomas J. Peter, Chicago, $9.93; Nash Bros., Chicago, $20; Farley & Green, Chicago, $18; Derheimer & Co., Ft. Wayne, $8.98; Edward Ryan, Springfield, O., $17.50; Adams Bros., Zanesville, O., $14.44½; J. H. Green & Sons, Appleton, Wis., $10.12; Griffith & McDermott, Chicago, $15.60.

BRIDGES.

Aurora, Ill.—The construction of a bridge across Turkey creek, on Spruce-st., is proposed.

Decatur, Ind.—Bids are asked until March 8 for building six bridges. Samuel Doak, chmn. co. comrs.

Elgin, Ill.—Plans are being prepared for two new bridges over Fox river. William F. Sylla, cy. engr.

Houston, Tex.—Plans and specifications for iron bridges at Hardy and Main-sts., will be prepared.

La Crosse, Wis.—The question of building a bridge over Black river is being considered.

Bryan, Tex.—A bridge will be built across the Navasota river at the old Ferguson crossing.

Arlington, Wash.—Bids will be asked for bridges over Boulder, Squire and French creeks. Co. comrs.

Camden, N. J.—Plans have been prepared for the proposed bridge across Cooper's creek at E. Pine-st.

Urbana, O.—The city engineer has been directed to prepare plans for an arched bridge on N. Main-st.

Akron, Ia.—The Plymouth county commissioners will call for bids for a steel bridge over the Big Sioux river.

Montgomery, Pa.—A petition has been circulated for a county bridge across the Susquehanna river at Nisbet.

San Angelo, Tex.—The construction of a bridge across North Concho, at a cost of $6,000 or $7,000 is proposed.

Sacramento, Cal.—The construction of a bridge across the American river at Fair Oaks is contemplated.

Lisbon, Portugal.—Bids will be received until March 23 for an iron bridge to be built in the port of Lorenzo Marquez.

Washington, Ia.—A petition will be circulated for a bridge across the English river west of Kalona, on the Wellman road.

San Antonio, Tex.—Bids are asked until April 2 for a steel girder bridge across San Pedro creek. Marshall Hicks, mayor.

Stevensville, Mich.—The township board contemplates building six bridges across the canal, at a cost of $8,000 or $9,000.

Ottawa, Ont.—Bids are asked until March 14 for a bridge over Carp river, be-

tween Huntley and Fitzroy twps. Charles McNab, co. clk.

Chicago, Ill.—Bids will be asked soon for a bridge across the Calumet river at Ninety-fifth-st. City Bridge Engr. Wilmann.

Selin's Grove, Pa.—Plans for a wagon bridge across the Susquehanna river from Shamokin dam to Sunbury, have been completed.

Orange, N. J.—The Wrought Iron Bridge company, Canton, O., secured the contract for an iron bridge over the dam at Campbell's pond.

Hartford, Conn.—The old Enfield bridge across the Connecticut river broke away Feb. 18, and three spans of it floated down the river.

Denver, Col.—The county commissioners have received a petition asking for bridges over the Kiowa and Lost creek east of Bennett.

East Zorra, Ont.—Bids are asked until March 3 for a steel highway bridge in East Zorra. James Anderson, clk., Zorra, South Zorra P. O.

Lewiston, Cal.—H. C. Ingram, surveyor, has been authorized to prepare plans and specifications for a steel bridge across Trinity river.

Utica, N. Y.—The highway bridges across the Mohawk river at Genesee-st. and at Park-ave. have been condemned. Paul Louis Schultze, cy. surv.

Stockton, Cal.—The city surveyor will probably be authorized to prepare plans for two steel bridges across Miner channel, one at Grant and one at Aurora-st.

Delaware, O.—Sealed bids will be received until March 16 for building a three-span plate girder bridge over the Olentangy river. E. E. Naylor, cy. clk.

Nashville, Tenn.—A bill has been sent to the city council asking for an appropriation for a bridge on Hudson-st., near the plant of the Nashville Hosiery company.

Flemington, N. J.—The board of freeholders has decided to build a new iron bridge over the south side of the Raritan river at Rockafellow's mills, near this place.

Omemee, Ont.—Bids are asked until March 3 for a steel superstructure and approaches for Cowan's bridge over Pigeon creek in Emily twp. Richard J. Granby, twp. clk.

Chicago, Ill.—Sealed bids are asked until March 28 for the superstructure of a railroad bridge across the main drainage channel. William Boldenweck, prest. sanitary bd. of trustees.

Mankato, Minn.—The board of public works was authorized, Feb. 16, to prepare plans and specifications for the construction of a bridge on the extension of Pleasant-st. Mayor Currier.

Battle Creek, Mich.—A resolution has been passed to advertise for bids for stone, concrete or steel bridges over the Battle Creek river on N. Jefferson-st. and W. Main-st. Geo. W. Ham, rec.; Mayor Moore.

Grand Island, Neb.—(Special.)—Arnold C. Koenig, co surv., says that Carl H. Menck, co. clk., will receive bids, March 21, for a new undertruss combination bridge across the Platte river, 6 mis. south of the village of Wood River.

Des Moines, Ia.—The contract for the new Floyd river bridge on E. Fourth-st. was awarded, Feb. 13, to N. M. Stark & Co., of this city, for $7,600. The Wrought Iron Bridge company, Canton, O., secured the contract for the construction of two tubular piers, at the east end of the Sioux river bridge, for $1,025.

Scranton, Pa.—(Special.)—Jos. P. Phillips, cy. engr., says the proposition to increase the indebtedness of the city in the sum of $167,000 for the purpose of constructing a viaduct on W. Lackawanna-ave. was defeated on Tuesday, the 20th, by the following vote of the tax-payers: For increase, 2,299; against increase, 5,933; majority against increase, 3,634.

Chicago, Ill.—Plans for a rocking bascule bridge were submitted to Assistant City Engineer Willman, Feb. 8, by F. G. Vent, C. E., 89 Twenty-fourth-st., Chicago. Mr. Willman advised Mr. Vent to prepare estimates of the cost of construction and other details so that his design may be considered when the question of deciding upon three bascule bridges, which the city contemplates building, comes up.

Des Moines, Ia.—Bids were received Feb. 14 for building a bridge over the Des Moines river on N. Sixth-ave., as follows: Steel bridge, Variety Iron Works, Cleveland, O., $66,200; Melan arch bridge, J. H. Killmar, Des Moines, $76,000; Melber 300-ft. arch steel and concrete, John Killmar, Des Moines, $83,000; Thatcher concrete plan, Capital City Brick and Tile company, $69,867; Geisel concrete bridge, Geisel Construction company, St. Louis, $78,130; all brick bridge, Edwin Thatcher, Patterson, N. J., designer, Capital City Brick and Tile company, $81,975.

PARKS.

New York City—The park board will establish a park at avenue A and Twenty-third to Twenty-fourth-st.

Topeka, Kas.—This city will build a park on the bank of the Missouri river. P. L. Wise, cy. engr.

Lowell, Ia.—The question of establishing a park in this town is being agitated. E. A. Stephenson is interested in the matter.

Newport, R. I.—The question of a special appropriation for completing the Esplanade will be voted on in April. William H. Lawton interested.

Flushing, L. I., N. Y.—The city park department has under consideration the condemnation of 200 acres of land near Kissena Lake, for a public park.

Rye, N. Y.—The question of issuing bonds for the purchase of Rye and Oakland beaches for a public park is being discussed. J. A. Gwynne is interested.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Coatesville, Pa.—A garbage crematory is proposed.

Milwaukee, Wis.—Bids are asked until March 12 for garbage disposal. Comrs. Pub. Works.

Columbus, O.—A bill has been introduced in the legislature empowering cities to erect garbage crematories.

Jackson, Miss.—Bids are desired for the construction of a garbage disposal plant. Walter G. Kirkpatrick, cy. engr.

Waterbury, Conn.—The question of building a crematory is being considered by the board of health. Dr. C. W. Frost.

Memphis, Tenn.—It is believed that Mayor Williams will submit an exhaustive report on the street sprinkling question in his annual message.

Baltimore, Md.—Street Commissioner Bye has recommended that the block system of street cleaning be substituted for the present "gang" system.

New Rochelle, N. Y.—A bill is before the council which provides for an appropriation of $20,000 for disposal works and for the collection of garbage.

New York City.—A bill will be introduced in the legislature providing for the establishment of a crematory plant for the consumption of garbage in this city.

Rochester, N. Y.—Bids are asked until March 2 (extension of date), for collection, removal and disposal of garbage and dead animals. E. P. Porter, clk bd. contract.

Minneapolis, Minn.—Bids are asked until March 9 for cremating kitchen garbage for three years, the city to purchase plant or renew contract at the end of that time. L. A. Lydiard, cy. clk.

Chicago, Ill.—A garbage reduction plant has been built at Twenty-sixth-st. and Archer-ave. The system employed is the invention of Charles Turner, general manager of the Chicago Reduction company.

Joliet, Ill.—The council rejected all bids for erecting the proposed crematory, and has instructed the city clerk to advertise for bids for a thirty-ton crematory including furnaces and approaches.

New York City.—Commissioner of Street Cleaning Nagle has made a record, according to local press reports, of which he may well be proud in ridding this city of the recent great fall of snow in so speedy and efficient manner.

Washington, D. C.—It is believed that the bill will pass authorizing the district commissioners to make a contract for the collection and disposal of garbage and dead animals. Bids will be asked immediately after its passage. Dr. Wm. C. Woodward, health officer.

STREET LIGHTING.

Yonkers, N. Y.—A municipal lighting plant is proposed.

St. Louis, Mo.—The Welsbach Street Lighting company was awarded the contract for lighting the city.

Union City, Mich.—A committee has been appointed to secure figures for an electric light plant.

Coatesville, Pa.—Bids will be asked soon for improvements to the light plant. Coatesville Gas company.

Houston, Tex.—Bids will be asked until March 20 for an electric light and power plant. S. H. Brashear, mayor.

Carthage, Ind.—(Special.)—The board of trustees is considering the construction of an electric light plant.

Stillwater, Minn.—Sealed bids are asked until March 6 for an electric light plant. J. H. Ward, cy. clk.

Monte Vista, Col.—The construction of a municipal electric light plant is proposed. A. W. Horn, mayor.

Columbus, O.—Electric lighting may take the place of gas and gasoline lights at the United States barracks.

Dickson, Tenn.—The city council is considering a proposition from a private party for erecting an electric light plant.

Casey, Ill.—The contract for an electric light plant has been awarded to the Commercial Electric company of Chicago for $36,000.

The question of issuing bonds for electric light plants will be voted on as follows: Alliance, O., March 3; Iola, Kas., March 19; Saginaw, Mich., March 5.

Pawtucket, R. I.—Arrangements are being made for the establishment of an electric lighting plant at the Spring Lake Mills, near Washington.

Boise City, Idaho.—The contract for lighting this city for two years has been awarded to the Capital Electric Light, Motor and Gas company, at $8 per month per arc light.

The question of issuing bonds for electric light plants has been favorably voted on as follows: Owensboro, Ky.; Duluth, Minn.; Elbow Lake, Minn.; New Wilmington, Pa.; Attica, O.

Peru, Ind.—The city council is considering a proposition for a fifteen-year franchise for an electric light plant, from Henry C. Allen and Samuel Perrott of Indianapolis.

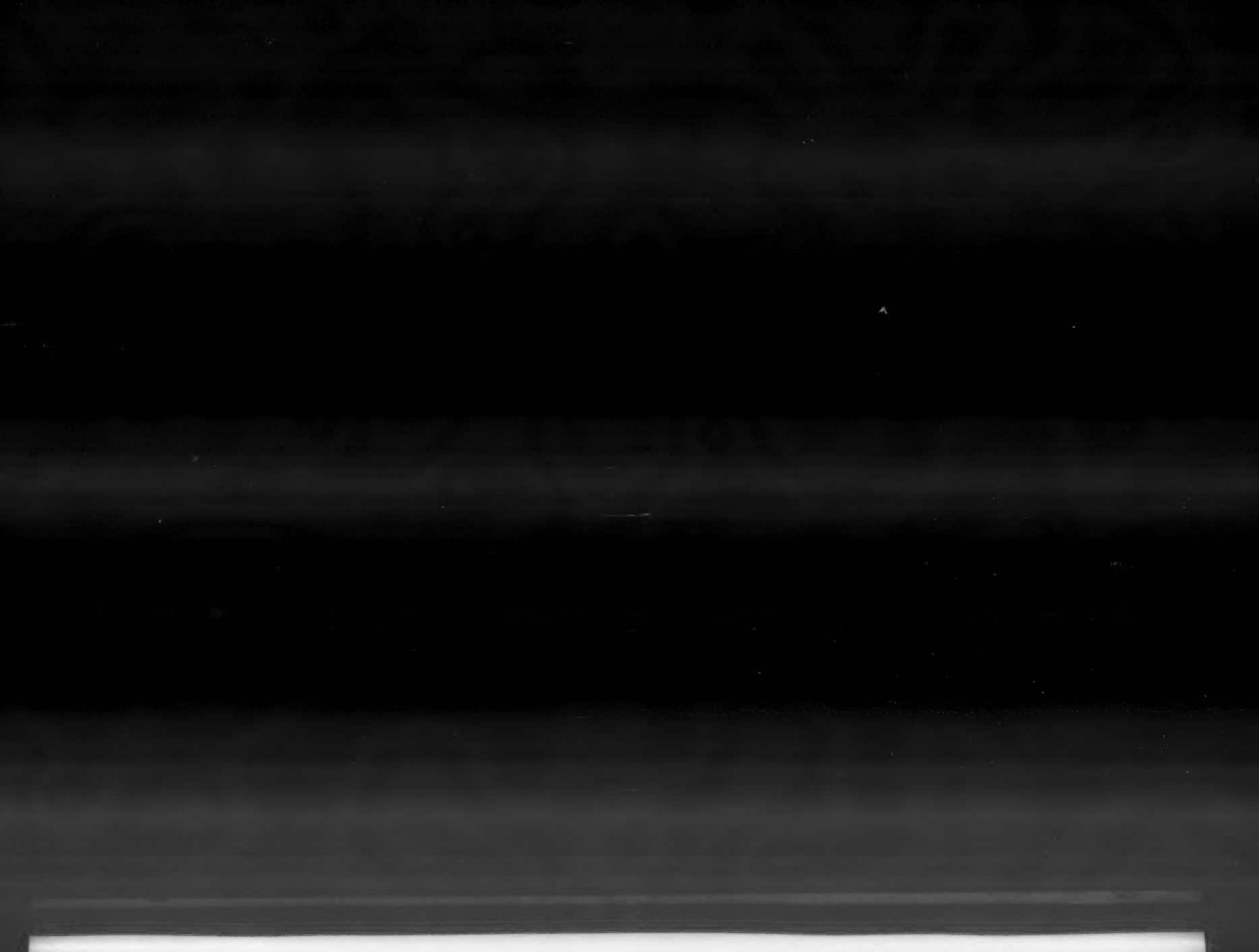
Philadelphia, Pa.—The special committee of the gas committee of councils was authorized, Feb. 19, to prepare an ordinance providing for an increase of 500 gasoline lamps.

Carlyle, Ill.—T. B. Volmer, Fred Feuiver and Fred Schafley have been appointed a committee to secure complete plans, specifications and estimates for an electric light plant. Paul Murray, cy. clk.

Chicago, Ill.—Sealed bids are asked until March 5 for lighting parts of the city and public places with gas and gasoline during the unexpired term of this year. Edward B. Ellicott, City Electrician.

Long Island City, N. Y.—The Long Island Electric Illuminating company secured the contract for lighting the streets of this city with 482 arc lights of 2,000 c. p. at 39½ cts. each per night, or $144 per lamp per year.

Dayton, O.—A resolution was passed Feb. 16 calling on the board of city officers to ask for bids for lighting this city prior to the spring election, at which time the question of the city erecting and operating its own plant may be submitted to vote.

Electric light plants are contemplated at the following places: Hagerstown, Ind.; Waterloo, Ind.; Still Pond, Md.; Hedrick, Ia.; Spencerville, O.; Auburn, Neb.; Stewartsville, Minn.; Alpha, Ill.; Minot, S. D.; Potwin, Kas.; Cartersville, Ga.; Clinton, Me.; Elmira, N. Y.; Ilion, N. Y.; Clayton, Del.; Colonial Beach, Va.; North Wilkesboro, N. C.; Ellisville, Miss.; Boonville, Mo.

Carlinville, Ill.—(Special.)—This city desires to enter into a new contract for lighting its streets and alleys, beginning July 1, 1900. The contract will be for a term of 10 yrs., 47 arc lights to be put in at once, with the privilege of 50, of 2,000 c. p. each, moonlight schedule, lights to burn from one-half hour after sunset to one-half hour before sunrise. Correspondence and proposals are invited. Robt. A. Hankins, mayor; Jas. F. Harkins, cy. clk.